COMMON FACTORS PERSPECTIVE IN PHYSIOTHERAPY FOR CHRONIC LOW BACK PAIN

EXPLORING THERAPISTS' VARIABLES AND THEIR CONTRIBUTION TO THE ALLIANCE

KU Leuven
Biomedical Sciences Group
Faculty of Kinesiology and Rehabilitation Sciences
Department of Rehabilitation Sciences

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Emanuel BRUNNER

Supervisor: Prof. Dr. Michel Probst
Co-supervisor: Prof. Dr. Wim Dankaerts

Chair:
Prof. Dr. Sabine Verschueren
Jury:
Prof. Dr. Simon Brumagne
Prof. Dr. Laurence Claes
Prof. Dr. Mira Meeus
Prof. Dr. Christoph Flückiger (external jury member)

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For Cristina, Jonas and Elias

Table of Contents

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General Introduction

1. General Introduction

1.1. Background of the Doctoral Thesis

Physiotherapists working in the field of musculoskeletal rehabilitation very frequently treat patients with chronic low back pain (CLBP). It is well accepted in the literature that psychological factors such as negative beliefs, unpleasant emotions and dysfunctional behaviours play an important role in the development and maintenance of CLBP.[1-4] In the past, musculoskeletal rehabilitation was predominantly dominated by biomedical interventions, including manual therapy and manipulative treatment approaches. Today, musculoskeletal rehabilitation has adopted research on psychological, social, and neurophysiological factors.[5,6] This transformation has resulted in the development of interventions that incorporate physical, neurophysiological, cognitive and behavioural strategies directed towards patients' individual barriers to recovery.[7-9]

The importance of psychological factors on patients' individual experience of chronic pain indicates that musculoskeletal rehabilitation for CLBP may work through mechanisms similar to psychotherapy.[10] The common factors perspective from psychotherapy posits that the benefits from psychotherapy are not only explained by the therapeutic technique provided for the patient. Instead, changes in therapy are seen to be a result of an interplay among common factors, expectations and the therapeutic technique.[11] Common factors refer to commonalities shared by different forms of therapy, including the patient-therapist relationship (or *alliance*). The common factors perspective may also be relevant for the musculoskeletal rehabilitation of CLBP.[10] There is indeed growing interest in the potential relevance of common factors in (musculoskeletal) rehabilitation, particularly regarding the alliance-outcomes relationship.[12-14]

This doctoral thesis aims to integrate mental health perspectives into musculoskeletal physiotherapy for CLBP. In psychotherapy, debates and research on common factors perspective have a long history.[11,15] This line of research focused mainly on the relationship between the alliance and treatment outcomes[16] but also considered factors that influence the alliance.[17] Research on common factors in physiotherapy is in an early stage. This doctoral thesis is novel and builds upon the clinical experience and scientific expertise of physiotherapists working in the field of mental health and musculoskeletal rehabilitation. The collaboration represents the interaction of different specialities within rehabilitation sciences and, particularly, the current process of modernisation that is observed in musculoskeletal rehabilitation.

The general introduction describes the complexity of CLBP and focuses particularly on the importance of psychological factors. Subsequently, common factors perspective from psychotherapy are introduced, and research related to the common factors perspective in physiotherapy for CLBP are outlined. Finally, this introductory chapter ends with the general and specific aims of this doctoral thesis and an outline of the different studies.

1.2. The Low Back Pain Problem

Low back pain (LBP) is a major health problem throughout the world and is related to high personal, social and economic burdens.[18-20] A systematic review on the global prevalence of LBP estimated the 1-month prevalence of activity-limiting LBP to be 23%.[20] Not every person suffering from LBP seeks health care services. Prospective cohort studies from Norway and Switzerland have shown that nearly half of individuals experiencing LBP do not seek any healthcare services.[19,21] However, the total cost of LBP is very high in European countries. In Switzerland, the direct medical costs were estimated at 6.1% of the total healthcare expenditure in 2005.[19] According to the Global Burden of Disease Study 2010, back pain is the number six contributor to disease burden across the globe but is the number one contributor in Western Europe and Australia.[22] These data indicate the high relevance of LBP problem for individuals, healthcare systems and societies in industrialized countries.

Most patients with a new episode of LBP do not recover and develop persistent pain, or recover but suffer from recurrent pain or flare-ups. Dunn et al. (2012)[23] followed 342 primary care consulters with LBP in the United Kingdom and identified four pain trajectories. Their study showed that approximately 30% of patients recovered rapidly from their pain problem.[23] Some, however, recovered slowly but had persistent mild pain (36%), others recovered slowly but suffered from fluctuating pain episodes (13%), and a large group did not recover and maintained high pain levels (21%).[23] These findings indicate that most patients with LBP suffer from a chronic health problem.

Definition of Chronic Low Back Pain

LBP is defined as pain and discomfort localized below the costal margin and above the inferior gluteal folds.[24,25] LBP can be associated with or without the referred leg pain.[24,25] Definitions of chronic or persistent LBP vary across clinical practice guidelines in terms of the cut-off point in time. Most guidelines define CLBP as LBP that persists for more than three months.[26] This widely accepted definition of CLBP will be used in this doctoral thesis.

The Complexity of Chronic Low Back Pain

Strong evidence indicates that CLBP is a multidimensional health problem that is associated with a complex interplay of physical, neurophysiological, psychological, life-style and social factors.[5] These factors are often inter-related, but the multidimensional profiles vary across patients.[6,27] This heterogeneity in patients with CLBP illustrates the complexity of the health problem.

Psychological Factors Associated with Chronic Low Back Pain

Psychological factors play an essential role in the development and maintenance of chronic musculoskeletal problems, including CLBP. The fear-avoidance model describes how disability and psychological distress (e.g., depressive or anxious mood) develop as a result of avoidance behaviours that are motivated by a fear of pain and pain catastrophizing.[1,28] Prospective studies have underscored the validity of the fear-avoidance model by identifying catastrophizing, fear-avoidance beliefs and depression as significant predictors for the transition from acute to CLBP.[3,29-31] Furthermore, pain self-efficacy, fear-avoidance, pain catastrophizing and distress were identified as significant mediators of psychological interventions for patients with chronic back pain.[2] Mediation analyses have helped explain the mechanism by which one factor (treatment) influences a dependent variable (outcome) through the mediator variable. Therefore, patient characteristics, including fear-avoidance, catastrophizing, distress and self-efficacy, should be considered important treatment targets for interventions in patients with CLBP.[2] In addition to these psychological barriers to recovery from CLBP, comorbid mental illnesses should be recognized as potentially important factors associated with CLBP.[32] Epidemiological research indicates that approximately 35% of individuals with CLBP have at least one clinically relevant affective disorder, with anxiety disorder being the most prevalent diagnosis.[33,34] The high prevalence of psychiatric comorbidity highlights the need to consider not only factors such as catastrophizing, fear-avoidance and distress but also mental illnesses as important factors associated with CLBP.

Physical, Neurophysiological, Life-Style and Social Factors Associated with Chronic Low Back Pain

Patient cognition, emotions and behaviours may play an essential role, but psychological factors do not explain the whole complexity of CLBP. A large body of research indicates that CLBP is often associated with physical factors including maladaptive functional behaviours. Patients with CLBP often perform a task in a manner that results in the provocation of pain and disability.[35] Patients can have both increased or decreased levels of abdominal wall and lumbar muscle co-activation.[36] Excessive (protective) muscle activation during movements and postures may result in increased and abnormal loading forces across pain-sensitive structures.[37] Maladaptive functional

behaviours resulting in self-provocation may also be related to changes in the central nervous system.[6,38] Physical and psychological factors may also be related to neurophysiological factors. Many patients with CLBP show features of central sensitisation, an alteration in the nervous system defined operationally as an amplification of neural signalling within the central nervous system that elicits pain hypersensitivity.[39,40] Neurophysiological pain mechanisms are highly heterogeneous in patients with CLBP and are closely inter-related with psychological, lifestyle and general health factors.[6,41,42] Lifestyle factors, including physical activity levels, sleep and smoking, may also be related to chronic pain.[43-45] Furthermore, a small body of research indicates that social factors such as a good social background has a protective effect against CLBP.[46]

The multidimensional pain presentation seen in patients with CLBP highlights the complexity of the problem and the difficulty related to treating these patients. Healthcare professionals are challenged to identify patient's individual barriers to recovery and to develop interventions targeted at modifiable factors that contribute to the persistent pain problem.[5]

Key Points: The Low Back Pain Problem

- CLBP is a complex multidimensional problem.
- Psychological factors are significant barriers to recovery from CLBP.
- Comorbid mental illnesses are frequently seen in patients with CLBP.

1.3. Physiotherapy for Chronic Low Back Pain

Patients with LBP seek very often health care from physiotherapists[18,19,21] The proportion of individuals who consult a physiotherapist may vary across countries. However, studies from several industrialized countries have shown that the largest proportion of direct medical costs related to LBP is spent for physiotherapy treatments.[18] In Switzerland, approximately 8% of individuals with LBP seek help from physiotherapy, but physiotherapy accounts for more than 11% of the total direct costs for LBP, and the costs for physiotherapy are higher than for any other form of active treatment.[19] These data indicate that physiotherapists are highly involved in the management of patients with LBP, at least in industrialized countries.

Minor Effects of Physiotherapy in Chronic Low Back Pain

In recent years, hundreds of randomized controlled trials (RCT) have been conducted to test the superiority of certain treatments over others to find the most effective intervention for patients with CLBP. Although these competitions between treatments have been repeated exhaustively, the

effects of interventions for CLBP have shown modest responses at best.[24] Only small contrasts in long-term outcomes were found between different physiotherapy treatments.[47-51] This very large body of research has not helped physiotherapists or patients to answer the following question: through which mechanisms does physiotherapy work for CLBP?

Several factors can contribute to the rather small effect sizes observed in RCTs evaluating active interventions for CLBP. First, estimates of treatment effects might be biased by methodological limitations. Most meta-analyses obtained only low-quality evidence due to methodological limitations.[47-51] However, small effect sizes may also be related to misdirected treatment strategies and mechanisms. Traditional physiotherapy interventions such as manual therapy, exercises, yoga, or electrotherapy, to name a few, often fail to address the whole complexity of patients' individual pain problem. Additionally, most RCTs do not integrate adequate strategies to target the intervention towards patient's individual pain profiles.[52] The consequence of this methodological shortcoming is that generalized interventions ('one size fits all approach') are often provided to a very heterogeneous group of patients.[37,52] It is likely that the lack of adequate targeting of the intervention to patients' individual barriers to recovery is related to the small effect sizes observed for most treatments for CLBP.

The absence of significant contrasts in outcomes between distinct different treatment concepts is surprising. For example, Ferreira et al[53] compared spinal manipulation and general exercises in a randomized controlled trial. These treatments are based on different concepts in terms of the theory, strategy and hypothesized treatment mechanisms, but comparisons showed non-significant differences in outcomes between treatment groups. Substantially different treatments for patients with CLBP demonstrating equal efficacy have given rise to the assumption that the variance in treatment outcomes can not only be explained by the specific therapeutic technique provided but also by factors that might be common to most treatments and factors that may not be related to the specific therapeutic technique.[12]

Key Points: Physiotherapy for Chronic Low Back Pain

- Individuals with CLBP often consult physiotherapists.
- Treatment results for patients with CLBP are modest at best.
- Treatment outcomes could be explained by more than the specific therapeutic technique provided.

1.4. The Common Factors Perspective in Psychotherapy

For decades, mental health professionals have observed that different forms of psychotherapies share common elements.[15,54,55] These commonalities are often described as '*common factors'*. The psychotherapeutic common factors perspective postulates that these commonalities, together with other factors, contribute to improvements in psychotherapy.

Research in psychotherapy has made enormous efforts to identify factors that account for psychotherapy success or failure. Lambert and Barley[56] proposed a common factors model based on experiences from decades of clinical research, but not on data from meta-analyses.[56] This model is presented in Figure 1. Extra-therapeutic factors or factors outside therapy (e.g., social support, fortuitous events) account for approximately 40% of treatment success. Expectancy (placebo effects) and the specific therapeutic techniques may each account for approximately 15%. Conversely, common factors may account for 30% of the variance in patient outcomes.[56]

The common factors perspective in psychotherapy is mainly based on the work of Jerome Frank.[54,55,57] Frank was one of the first to describe how a therapeutic ritual is necessary for all treatments.[55] This common factors perspective conceptualized psychotherapy as mediated healing practice and describes the factors necessary and sufficient for improvements in therapy: (i) an emotionally charged, confiding relationship with a therapist; (ii) a setting in which the patient presents to a therapist who the patient believes has the power, expertise, or ability to help and is entrusted to work on the patient's behalf; (iii) a rationale, conceptual scheme, or myth that explains the patient's symptoms or complaints; and (iv) a procedure or ritual that is consistent with the rationale, conceptual scheme, or myth that is provided to the patient.[54,55] Based on this conceptualization, the common factors perspective makes important predictions. The first prediction is that all psychotherapies that contain these common factors are efficacious.[57] The second important prediction is that the patient-therapist relationship (or *alliance*) should predict patient outcomes.[57]

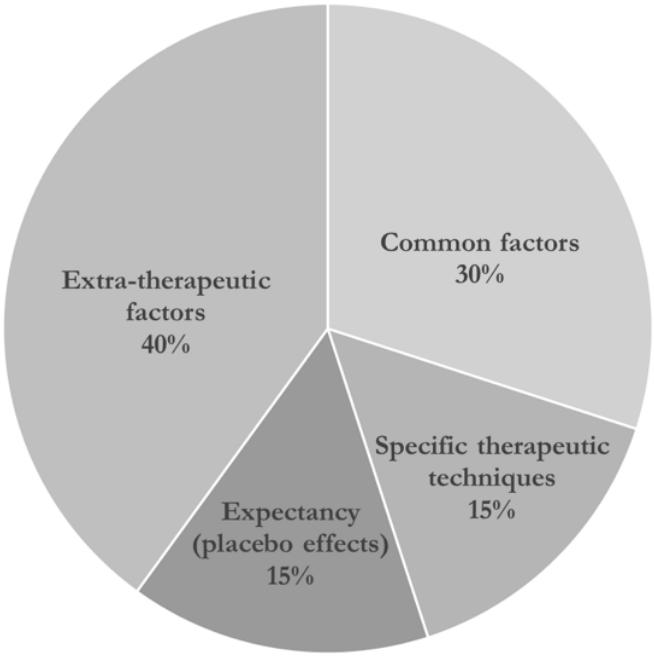

Figure 1: Common Factors Model from Psychotherapy in Which Improvements in Patients are Expressed (in %) as a Function of All the Different Factors Involved.[56]

There is controversy regarding the predictions of the common factors perspective. Meta-analyses of psychotherapies have concluded that clearly different 'bona fide' therapies produce similar beneficial effects.[58,59] This term 'bona fide' was derived from the psychotherapeutic common factors perspective based on the conceptualization of Jerome Frank's work.[54] Findings from these meta-analyses indicated that any form of psychotherapy that contains common factors is similarly efficacious, and conclusions were illustrated with the Dodo Bird verdict from Alice in Wonderland: 'everybody has won, and *all* must have prizes…'.[58,59] However, these studies have been criticized, mainly due to methodological limitations and overgeneralizations of results from meta-analyses.[60]

In contrast, there appears to be agreement regarding the other important prediction of the common factors perspective, namely, that the alliance is related to the outcomes. A large meta-analysis including 190 data sets that examined the alliance-outcome relationship found a robust effect size (r=0.28; 95%CI: 0.25 to 0.30) for the alliance-outcome relationship in psychotherapy.[16] The relationship between the alliance and treatment outcomes did not differ for different types of psychotherapies (e.g., cognitive behavioural therapy or psychodynamic approaches).[16] This robust alliance-outcome relationship indicates that the development of a strong alliance is vital for patient improvements and that the alliance matters in all forms of psychotherapy.[11,16,61,62]

What is the Alliance in Psychotherapy?

The term **alliance** (also *therapeutic alliance, working alliance, and helping alliance*) refers to different constructs of the relationship between the patient and therapist. The different constructs of the alliance might be inter-related, but there is no consensually accepted definition of the alliance concept.[16] The concept of the alliance is often defined by the construct of the instrument that is used to measure the patient-therapist relationship in treatment.[16]

One of the most frequently used instruments for measuring alliance is the Working Alliance Inventory (WAI).[16,63] This instrument is based on the concept of the working alliance proposed by Bordin[64]. Bordin's idea was that the alliance is centrally to achieve a collaborative therapeutic relationship between the patient and therapist.[64] The construct of the WAI is based on (i) agreement on the therapeutic goals; (ii) agreement on the task assigned to the patient and the therapist; and (iii) an emotional bond between the patient and therapist.[64] Measures of the WAI are therefore supposed to reflect the extent of a positive therapeutic collaboration between the patient and the therapist. The WAI is only one of the four 'core' measures of alliance in psychotherapy.[16] The other 'core' measures of the alliance that are frequently used in psychotherapy are the California Psychotherapy Alliance Scale (CALPAS), the Helping Alliance Questionnaire (HAq), and the Vanderbilt Psychotherapy Process Scale (VPPS).[16] These and other measures might be based on a different conceptualization of the alliance. However, it is important that the estimated alliance-outcome relationship in psychotherapy was not moderated by the instrument used to measure the alliance.[16]

Therapists' Contribution to the Alliance?

The significance of the alliance-outcome relationship in psychotherapy has been confirmed consistently across meta-analyses addressing different forms of psychotherapy (e.g., CBT or psychodynamic approaches) and for adults and for adolescents.[16,61,62,65,66] Less is known about therapists' contribution to the alliance. It seems that psychotherapists vary in their ability to form alliances[67-69] and that therapist self-reported variables predict the alliance.[17] Nissen-Lie et al. (2010)[17] found that therapist self-reported characteristics, such as therapists' experience of difficulties in treatment, predict the patient-rated alliance measured in early treatment. These findings indicate that some therapists are better than others at fostering alliances with their patients and that therapists' interpersonal skills relate to patient improvements during therapy.

Difference Between Patient and Therapist Alliance Ratings

Patients' perspectives of the alliance in treatment seem to be more positive than patient-rated alliances in psychotherapy. The correlation between patient- and therapist-rated alliances was found to be moderately positive (r=0.36).[70] The discrepancy between ratings was largest in patients with low levels of psychological disturbances.[70] The positive correlation indicates that patients and therapists have similar but not identical perspectives regarding the alliance.

Is a Relationship Already Treatment?

The common factors perspective highlights the importance of the alliance and postulates that the application of specific therapeutic technique(s) do not fully explain why patients change during or following an intervention. This perspective could be (mis)used to postulate that every empathic and trustful person can perform a successful treatment and that everything works as long as there is a strong relationship between the patient and the therapist.

This interpretation is incorrect because, in the absence of common factors working together with the therapeutic techniques, there is no intervention.[11,55] The common factors perspective describes mechanisms through which therapies work. These mechanisms include common factors, expectations (or placebo) and therapeutic techniques.[11,71] Therefore, the aim of the common factors perspective should be not to question the influence or the importance of specific therapeutic techniques but to better understand how and why patients benefit from therapies.

Key points: The Common Factors Perspective in Psychotherapy

- The common factors perspective postulates that psychotherapy works through different mechanisms, including common factors, expectancy and the specific therapeutic technique.
- There is strong evidence for the alliance-outcome relationship in psychotherapy.
- The psychotherapist contributes significantly to the development of the alliance.

1.5. The Common Factors Perspective in Physiotherapy

The importance of psychological barriers to recovery and the high prevalence of comorbid mental illnesses in patients with CLBP may indicate similarities in terms of treatment mechanisms between psychotherapy and physiotherapy.[10] These similarities indicate that the common factors perspective could also be relevant in physiotherapy. However, research related to the common factors perspective in physiotherapy in CLBP remains very limited.[10,63]

The Alliance-Outcome Relationship in Physiotherapy

Few studies have examined the alliance-outcome relationship in physiotherapy practice. A systematic review from 2010 identified ten published studies that examined the alliance outcome relationship in physiotherapy.[13] Findings from this review indicate the possible presence of a positive relationship between the patient-rated alliance and outcomes, but these findings are not based on meta-analytical analyses.[13] In a later study, Ferreira et al[12] identified the patient-rated alliance measured in early treatment as a significant positive predictor of improvements in physiotherapy for patients with CLBP. Similarly, Fuentes et al[14] showed in an experimental controlled study that the effect of a passive therapeutic technique (electrotherapy) can be improved significantly when the therapy is delivered in a context with enhanced patient-therapist alliance. These novel studies indicate that the alliance might be positively related to outcomes in physiotherapy for patients with CLBP.

What Contributes to the Alliance in Physiotherapy?

Very little is known about the influence of patient or therapist variables on the alliance and the alliance-outcome relationship. Scott et al[72] found a negative relationship between patients' perception of injury-related injustice and patient alliance in rehabilitation for patients with chronic musculoskeletal pain. Currently, it seems that the contribution of the therapist to the alliance has never been explored.

Key Points: Common Factors Perspective in Physiotherapy

- Literature on common factors in physiotherapy is very limited.
- There is some knowledge that the patient-rated alliance predicts treatment outcomes independent of the intervention provided for the therapist.
- Factors contributing to the alliance have never been explored in physiotherapy for CLBP.

1.6. Physiotherapy Research on Common Factors

In physiotherapy, the literature on the common factors perspective is very limited. However, research on physiotherapists' experience in therapy, therapists' attitudes and beliefs, and their clinical behaviour has received more attention in recent years. These different lines of research are related to common factors and might be informative for future research on common factors in physiotherapy for CLBP.

Physiotherapists' Experience and Their Expertise in Managing Chronic Low Back Pain

Qualitative research on physiotherapists' experience in managing patients with CLBP has disclosed that therapists often feel unprepared to address psychological factors.[73,74] Some physiotherapists may even stigmatize patients with high psychological barriers to recovery.[73,75] Psychotherapy research has shown that therapists' experience of difficulties in therapy negatively influence the patient-rated alliance.[17] Therefore, it can be assumed that physiotherapists' lack of confidence in their own ability to manage the patient and a negative affectivity towards these patients negatively influence the interaction between the patient and the therapist.

The Relationship Between Physiotherapists' Attitudes and Beliefs Towards Low Back Pain and Their Treatment Behaviour

Several studies have examined the relationship between healthcare providers' attitudes and beliefs towards LBP management and their treatment behaviour.[76-79] In this line of research, healthcare providers' attitudes and beliefs towards LBP management (or their treatment orientation) are separated in two different approaches: a biomedical and a biopsychosocial approach. The *biomedical approach* postulates that all signs and symptoms are a consequence of tissue damage or physical pathology, whereas the *biopsychosocial approach* highlights the role of psychological and social factors in the development and maintenance of chronic musculoskeletal problems.[80] It was shown that physiotherapists with a strong biomedical orientation might be less likely to implement current clinical practice guidelines for LBP, which highlight the importance of the biopsychosocial model of care.[77] Additionally, healthcare providers with a biomedical orientation may even influence patients' beliefs that painful movements result in tissue damage.[81]

This line of research is closely related to the fear avoidance model (see Figure 2).[1] It was assumed that research on the relationship between healthcare providers' orientation towards LBP management and their treatment behaviour may have the potential to extend the fear-avoidance model.[81] More information regarding the influence of external factors may help better understand how patients develop psychological barriers (e.g., fear of pain, avoidance behaviour) to recovery. External factors may include information or therapeutic recommendations given to the patient.

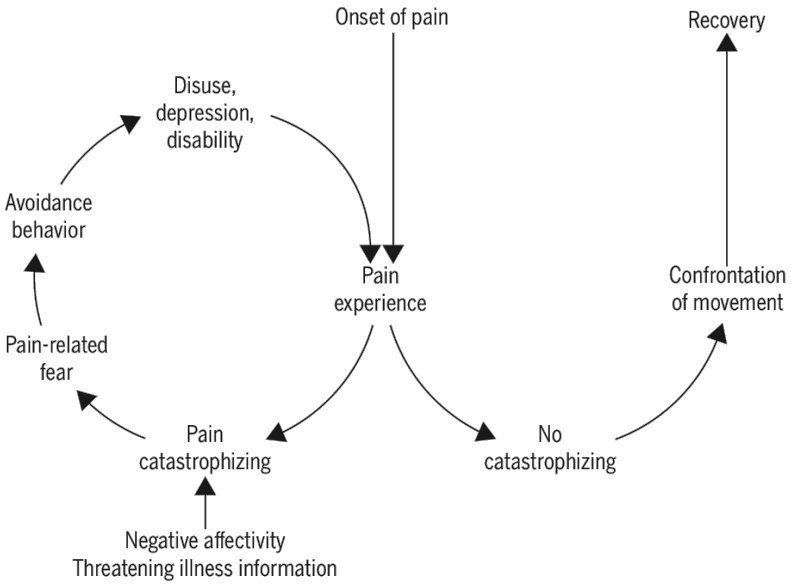

Figure 2: Fear-Avoidance Model[1]

Research on the relationship between physiotherapists' attitudes and beliefs towards LBP and their treatment behaviour is also related with the common factors perspective. The psychotherapeutic common factors perspective considers the rational, conceptual scheme, or myth that explains patient's symptoms as an essential component of the healing practice.[54,55,57] The rational or conceptual scheme that explains patient's symptoms may also include therapists' attitudes and beliefs towards LBP. It might be essential for a positive patient-therapist alliance that the information or therapeutic recommendations given to the patient are accepted by the patient, and additionally, that the therapeutic procedures are consistent with the provided explanations of the problem. Additionally, therapists' aims for the treatment should be somewhat congruent with patients' understanding of the LBP problem. It is therefore likely that therapists' and patients' attitudes and beliefs towards LBP, as well as the congruence between the two perspectives, influence the alliance in physiotherapy.

The Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) is one of the questionnaires most frequently used to measure physiotherapists' orientation towards LBP management.[76,78,79,82,83] This instrument was developed to measure the magnitude of physiotherapists' biomedical and biopsychosocial orientation.[76,80] Despite the popularity of this questionnaire, there are concerns regarding its validity. Research has demonstrated that the hypothesized 2-factor model was not robust across several validation studies investigating the PABS-PT,[76,78,79] and the internal consistency of the two subscales was problematic.[78,79,82] Further research on the construct validity of the PABS-PT is thus essential before this instrument can be used to examine the relationship between therapists' orientation towards LBP management and the patient-therapist interaction and the alliance.

Valid measures of physiotherapists' treatment behaviour are essential in this line of research. Previous studies have investigated the relationship of physiotherapists' attitudes and beliefs towards LBP management and physiotherapists' treatment behaviour with clinical vignettes.[76-78] Clinical vignettes are written case scenarios presenting fictitious patients. Respondents to these vignettes are asked to report what their clinical behaviour would be based on these specific case scenarios. The vignettes used in previous studies for measuring physiotherapists' treatment behaviour present a rather limited type of vignettes,[84] and capture only physiotherapists' therapeutic recommendation regarding activity and work. Clinical vignettes seem to be appropriate to measure certain aspects of healthcare providers' competence in clinical practice.[85] However, it has been stated that these indirect and self-reported measures of behaviour may not describe physiotherapists' behaviour in real clinical practice.[85,86] Indeed, it is not unlikely that these clinical vignettes provide more of a reflection of physiotherapists' knowledge of what should be done by healthcare providers rather than their actual clinical behaviour.

Key Points: Physiotherapy Research in the Context of the Common Factors Perspective

- Qualitative research disclosed that physiotherapists often have difficulties identifying and dealing with psychological factors in CLBP.
- Several studies tested the relationship between therapists' attitudes and beliefs towards LBP and aspects of therapists' treatment behaviour.
- There are concerns regarding the validity of measures that are frequently used to examine relationships between therapists' attitudes and beliefs and their treatment behaviour.

1.7. General Aim and Main Objectives of the Doctoral Thesis

The general aim of this doctoral thesis was to measure common factors that might be relevant in physiotherapy for patients with CLBP and to examine how therapists' variables contribute to the alliance measured in early treatment. To address this general aim of the doctoral thesis, the following three main objectives were further defined:

I. To validate research methods frequently used to measure therapists' variables.
II. To test physiotherapists' ability to identify and address psychological factors in clinical practice for patients with CLBP.
III. To explore the contribution of therapist and patient variables to the patient-rated alliance in physiotherapy for CLBP.

These objectives were realized by conducting four studies, which are outlined in three parts (**Part I, II and III**).

1.8. Outline of the Studies

Table 1 provides an overview of the studies and the specific research objectives. In **Part I**, research methods that are commonly used in previous studies to measure the magnitude of physiotherapists' biomedical and biopsychosocial orientation towards LBP and physiotherapists' treatment behaviour are validated. The specific objectives are as follows:

- To re-examine the factor structure of the German version of the PABS-PT as a measure of physiotherapists' attitudes and beliefs towards LBP management. (Study 1)
- To validate clinical vignettes as a measure of physiotherapists' treatment behaviour. (Study 2)

Part II tests physiotherapists' ability to identify and address psychological factors associated with CLBP. The specific objectives are as follows:

- To test correlations between patient-reported psychological factors at treatment baseline and physiotherapists' intuitive assessment of psychological factors after the intake session. (Study 3)
- To examine how patient-reported psychological factors at treatment baseline influence physiotherapists' self-reported competence to manage the patient measured after the intake session. (Study 3)

In **Part III**, the contribution of therapist and patient variables to the patient-reported alliance is explored. The specific objectives are as follows:

- To explore associations between patient-rated alliance, physiotherapists' self-reported competence and satisfaction to manage the patient, and patient-reported psychological distress. (Study 4)
- To explore associations between patients' communication of negative emotions during the intake session and the patient-rated alliance. (Study 4)

The doctoral thesis will be concluded with a **General Discussion** summarizing the main findings of the studies, discussing further the implications of the findings, and proposing directions for future research. The **Appendix** (book chapter) provides a brief overview of the clinical assessment and therapeutic strategies relevant for physiotherapy in CLBP with comorbid mental illnesses.

Table 1: Overview of the General Aims of the Chapters, Specific Objectives, Research Design and Setting of the Studies

	Main Objective	**Studies**	**Specific Objective(s)**	**Research Design**	**Setting**
Part I	Validation of research methods.	Study 1	- To re-examine the factor structure of the German version of the PABS-PT as a measure of physiotherapists' attitudes and beliefs towards LBP management.	Cross-sectional survey study.	Online survey in Switzerland
		Study 2	- To validate clinical vignettes as a measure of physiotherapists' clinical behaviour.	Validation study comparing clinical vignettes[1] with standardized patients[2].	Physiotherapy clinics in Switzerland
Part II	Testing physiotherapists' ability to identify and address psychological factors in CLBP.	Study 3	- To test correlations between patient-reported psychological factors at treatment baseline and physiotherapists' intuitive assessment of psychological factors after the intake session. - To examine how patient-reported psychological factors at treatment baseline influence physiotherapists' self-reported competence to manage the patient with CLBP.	Pragmatic, cross-sectional study.	Public hospital in Switzerland
Part III	Exploring the contribution of therapist and patient variables to the alliance in physiotherapy.	Study 4	- To explore associations between alliance, physiotherapists' self-reported competence and satisfaction to manage the patient, and patient-reported psychological distress. - To explore associations between patients' communication of negative emotions during the intake session and patient-rated alliance.	Naturalistic, cohort study.	Public hospital in Switzerland

PABS-PT = Pain Attitudes and Beliefs Questionnaire for Physiotherapists; LBP = low back pain; CLBP = chronic low back pain; [1]clinical vignettes are written case scenarios, in which therapists are asked to report how they would behave in the described situation; [2]standardized patients are actors performing as standardized patients in real clinical practice.

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PART I - Validation of Research Methods (Studies 1 and 2)

2. Factor Structure of the German Version of the Pain Attitudes and Beliefs Scale for Physiotherapists (Study 1)

Emanuel Brunner[1,2], Wim Dankaerts[3], André Meichtry[4], Kieran O'Sullivan[5,6], Se-Sergio Baldew[7], Michel Probst[1]

[1] Adapted Physical Activity and Psychomotor Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[2] Institute of Physiotherapy, Kantonsspital Winterthur, Winterthur, Switzerland

[3] Musculoskeletal Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[4] Institute of Physiotherapy, School of Health Professions, Zurich University of Applied Sciences, Winterthur, Switzerland

[5] Sports Spine Centre, Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar

[6] Department of Clinical Therapies, University of Limerick, Limerick, Ireland

[7] Faculty of Medical Sciences, Anton de Kom University of Suriname, Paramaribo, Suriname

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2.1. Abstract

The Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) is a questionnaire that is frequently used to measure the treatment orientation of physiotherapists and other healthcare providers towards low back pain (LBP). Previous validation studies of the PABS-PT have reported consistently that exploratory factor analysis (EFA) yielded a 2-factor model with the factors 'biomedical' and 'biopsychosocial'. However, there remain concerns regarding the composition of these two factors and the internal consistency of the "biopsychosocial" factor. The objective of this study was to replicate the previous validation study on the German PABS-PT. EFA was implemented to reexamine the underlying structure of the scale, and confirmatory factor analysis (CFA) was used to test the fit of the hypothesized 2-factor model. Results of the initial validation study were not replicated. EFA indicated that a 2-factor solution is an inadequate representation of the PABS-PT data, and CFA showed insufficient fit of the hypothesized 2-factor model to the PABS-PT data. Our results indicate a need for caution when using the PABS-PT to measure physiotherapists' orientation towards LBP, particularly in measuring the magnitude of a biopsychosocial orientation.

2.2. Introduction

Research on the attitudes and beliefs of physiotherapists regarding the management of low back pain (LBP) has received much attention during recent years. Numerous studies have investigated the influence of attitudes and beliefs on the clinical management provided by physiotherapists and other healthcare providers.[1-6] Other studies have focused on the effect of educational programs on healthcare providers' orientation towards LBP.[7-9]

The Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) was developed to measure attitudes and beliefs or treatment orientations. The multidimensional structure of the PABS-PT may explain the popularity of this instrument for measuring two different sets of attitudes and beliefs: biomedical and biopsychosocial orientations. The biomedical approach postulates that all signs and symptoms are caused by tissue damage or physical pathology, whereas the biopsychosocial approach highlights the role of psychological and social factors in the development and maintenance of chronic musculoskeletal problems.[5] A therapist with a strong biomedical orientation is less likely to implement current guidelines for the management of LBP and may even induce patients' fear or their beliefs that painful activities result in tissue damage.[10] Therefore, measuring healthcare providers' attitudes and beliefs regarding the management of LBP might be relevant.

The factor structure of the PABS-PT has been tested in several validation studies. In the initial developmental study by Ostelo et al.[5], the construct of the attitudes and beliefs of physiotherapists toward LBP management was measured by using a 31-item pool.[5] After testing the performance of the item pool, several problematic items were discarded, and the subsequent exploratory factor analysis (EFA) yielded a 2-factor model consisting of 20 items. Houben et al.[3] amended this first version of the PABS-PT and reexamined the factor structure of the measurement scale. Instead of using the initially proposed 20-item scale, the authors added five new items to the 31-item pool and replicated the factor analytical procedure described in the initial developmental study.[3] Similar to the initial study, several measured items were eventually excluded, and EFA yielded a new 2-factor model that included 19 measured variables. Later validation studies used different item pools and excluded different items from the factor models fitted to the measurement scale.[1,2,4,6] In the validation study of the German language version of the PABS-PT, Laekeman et al.[6] used the 36-item PABS-PT scale from Houben et al[3] but included only a 17-item pool in the EFA. However, the two identified common factors significantly influenced only 14 PABS-PT items. Table 1 shows an overview of the different common factor models obtained in previous validation studies of the PABS-PT.

There remain concerns regarding the factor structure of the PABS-PT. The validity of the hypothesized 2-factor model might be problematic, because the factor models describe the underlying structure of different item pools, but not the structure of the PABS-PT that was used to measure physiotherapists' orientation towards LBP. Furthermore, the compositions of the biomedical and the biopsychosocial factors were different across previous validation studies of the PABS-PT, particularly regarding the biopsychosocial factor (see Table 1). Furthermore, the internal consistency of this "biopsychosocial" factor was found to be poor (Cronbach's alpha: <0.60) in the models estimated using the German, Turkish, and Norwegian measurement scales.[1,2,6] The actual fit of the hypothesized 2-factor model to the PABS-PT remains unknown. Confirmatory factor analysis (CFA) allows the testing of specific hypotheses about the data.[11] However, this statistical method has never been used to test the fit of the hypothesized 2-factor model of the PABS-PT data.

Previous studies have mentioned that the PABS-PT is still in a developmental phase.[12,13] Nevertheless, the PABS-PT has never been revised, and confusion remains regarding the factor structure and composition of this frequently used questionnaire. We aimed to replicate the previous validation study on the German version of the PABS-PT,[6] and implement EFA and CFA to examine the factor structure of the questionnaire. The first objective was to examine the factor structure of the 36-item scale, which was used to measure the attitudes and beliefs of physiotherapists. The second objective was to reexamine the underlying structure of the 17-item pool, which was included in the previous validation study of the German language version of the PABS-PT.[6] The third objective was to test the fit of the hypothesized 2-factor model. For the latter objective, CFA was implemented to test the fit of the hypothesized model including the 14 items that were influenced by factor model, as identified from the EFA in the initial factor analysis of the German PABS-PT.[6]

Table 1: Overview of the Previous Factor Analysis Studies of the PABS-PT

Characteristics	**Ostelo et al, 2003**	**Houben et al, 2005**	**Laekeman et al, 2008**	**Dalkilinc et al, 2015**	**Mutsaers et al, 2014**	**Eland et al, 2016**
Language:	Dutch	Dutch	German	Turkish	Dutch	Norwegian
Composition of the scale:	31-items	36-items	36-items	31-items	36-items	36-items
Number of items included for factor analysis:	20	19	17	13	15	19
Factor composition[a] of the factor 1 "biomedical":	**25**, 24, **31**, 26, 22, 30, 10, 13, 14, 9, 20, 5, **23**, 4	**31**, **25**, 10, 22, 30, 14, 24, **23**, 20, 35	**25**, **31**, **23**, 10, 30, 26, 35, 4, 5, 14	24, **23**, **31, 25**, 28, 14, 9	**25**, **23**, 24, 29, **31,** 10, 20,	**25**, 20, 30, **31**, 24, 10, **23**, 14, 26, 4, 5, 35, 22
Internal consistency[b] of the factor 1:	$\alpha = 0.83$	$\alpha = 0.73$	$\alpha = 0.77$	$\alpha = 0.72$	$\alpha = 0.75$	$\alpha = 0.79$
Factor composition[a] of the factor 2 "biopsychosocial":	7, 12, 6, 3, 27, 11	33, 11, 29, 34, 17, 7, 12, 27, 6	34, 29, 19, 11	20, 15, 13, 12, 17, 30	12, 36, 17, 6, 7, 33, 27, 3	11, 33, 29, 34, 17, 22
Internal consistency[b] of the factor 2:	$\alpha = 0.54$	$\alpha = 0.68$	$\alpha = 0.58$	$\alpha = 0.59$	$\alpha = 0.73$	$\alpha = 0.55$

[a] the factor composition relates to the PABS-PT items influenced by the factor; [b] Cronbach's alpha; numbers in bold indicate items which were consistent across previous factor models; for clarity of presentation, items are sorted in descending order based on the magnitude of loadings on measured items.

2.3. Material and Methods

Procedure and Participants

General physiotherapists (N = 1.066) and physiotherapy students (N = 111) working or studying in the German-speaking part of Switzerland were recruited for this cross-sectional survey study. The aim was to recruit participants similar to the sample included in the previous validation study,[6] which was done in Germany. The email addresses of the general physiotherapists were derived from an online database provided by the Swiss Physiotherapy Association. To be eligible for inclusion in the survey, the physiotherapists had to be treating LBP patients in their clinical practice (>1 patient monthly). The physiotherapy students were third year undergraduates who had received training in LBP management. Online questionnaires were sent by e-mail, with one reminder e-mail sent two weeks later. The study was approved by the ethics committee of the Canton of Zurich.

Measures

Demographics. The sociodemographic and professional characteristics of the participants were recorded, such as age, sex, years of experience in treating LBP patients, specialization in LBP management, and the frequency with which they treated LBP patients in their individual clinical practice.

PABS-PT. The participants completed the German 36-item PABS-PT scale, which was translated from Dutch by using the forward-backward procedure.[6] The measurement scale had a Likert-type response format with six answer categories: 1 = totally disagree; 2 = largely disagree; 3 = disagree to some extent; 4 = agree to some extent; 5 = largely agree; and 6 = totally agree. An example of a 'biomedical' statement is item 25: 'Increased pain indicates new tissue damage or the spread of existing damage'. An example of a 'biopsychosocial' statement is item 34: 'Exercises that may be back straining should not be avoided during the treatment'. Higher scores represent stronger agreement with the statement.

Statistical Analysis

Statistical analysis was carried out with the psych package R, version 2.14.1.[14] Data means, standard deviations, skewness, and kurtosis were calculated to evaluate the performance of each item.

Exploratory Factor Analysis. EFA was applied on two different item pools; first, on the 36 measured items; and second, on the 17-item pool. The adequacy of the empirical correlation matrix for EFA was verified by using the Kaiser-Meyer-Olkin (KMO) factor. The aim of EFA is to account for, or "explain," the covariance matrix by a minimum, or at least a small number, of unobserved or latent common factors.[15] The data X consists of n observations of a p-dimensional centred vector ($p = 36$) of indicators (variables). A k-factor model ($k < p$) for the i-th p-dimensional observation vector X_i is given by:

$$X_{i1} = \lambda_{11} f_{i1} + \ldots + \lambda_{1l} f_{il} + \ldots + \lambda_{1k} f_{ik} + u_{i1}$$
$$\ldots = \ldots$$
$$X_{ij} = \lambda_{j1} f_{i1} + \ldots + \lambda_{jl} f_{il} + \ldots + \lambda_{jk} f_{ik} + u_{ij}$$
$$\ldots = \ldots$$
$$X_{ip} = \lambda_{p1} f_{i1} + \ldots + \lambda_{pl} f_{il} + \ldots + \lambda_{pk} f_{ik} + u_{ip},$$

with i=1,…,n; j=1,…,p; and l=1,…, k. The factor scores $f_i = (f_{i1}, \ldots, f_{ik})^T$ are the unobserved scores on the common factors; $u_i = (u_{i1}, \ldots, u_{ip})^T$ denotes the *specific factors* or *uniquenesses* representing the source of variation (unique factor), with the j-th component of u_i affecting only the corresponding indicator X_{ij}; and λ_{jl} refers to the factor loadings of the j-th indicator on the l-th factor.

Correlation matrix. Pairwise deletion of missing items was used to compute the empirical correlation matrix. In EFA, the eigenvalues of the estimated reduced correlation matrix are computed. Squared multiple correlations (SMC) were used as initial communality estimates.

Determining the number of factors to retain. Parallel analysis, the Kaiser criterion (eigenvalue > mean eigenvalues), and Cattell's scree test were used in combination with non-graphic tests (optimal coordinates and acceleration factor) to determine the number of factors to retain in the common factor model. Additionally, the likelihood ratio statistic was used to test the model fit.

Parallel analysis is based on a comparison between eigenvalues obtained from sample data and eigenvalues that one would expect to obtain from completely random data.[16] A model is specified with the same number of common factors as real eigenvalues (sample data) that are greater than the eigenvalues from random data. For the Kaiser criterion, eigenvalues from the reduced correlation matrix are computed. Eigenvalues derived from the reduced correlation matrix sum up to less than p, and therefore, the criterion *eigenvalues > mean eigenvalues* must be used in EFA.

In the scree test, eigenvalues from the reduced correlation matrix are computed and plotted in descending order. The graph of eigenvalues is then examined to identify the last substantial drop in the line.

Non-graphic or numerical solutions to the subjective scree test have been proposed: the acceleration factor and the optimal coordinates index.[17] The acceleration factor indicates the location of the elbow of the scree plot. It corresponds to the acceleration of the curve (e.g., the second derivative). The optimal coordinates are the extrapolated coordinates of the previous eigenvalues that allow the observed eigenvalue to go beyond this extrapolation. The extrapolation is made through linear regression by using the last eigenvalue coordinates and the k+1 eigenvalue coordinates.

In the likelihood ratio framework, the likelihood ratio test can be used to compare the fit of two nested models under the assumption of a normal distribution of the data. Thereby, we tested if the model with k = 1, 2, … factors was sufficient by constructing a likelihood ratio test that compared the null hypothesis (H_0 = "k factors are sufficient") with the alternative hypothesis (H_1 = "k factors are not sufficient"). The test was applied to a series of numbers of factors (k), starting with one and continuing until a nonsignificant test statistic was obtained, indicating that the common factor model with the corresponding number of factors was not rejected.[18] The likelihood ratio statistic was approximately chi-square distributed, with degrees of freedom equal to the number of unique elements in the covariance matrix (Σ) minus the number of variables estimated. The significance level was set at alpha = 0.05.

Factor rotation. Principal axis was used as the method of factor extraction. The extracted factors are likely to be related to one another if the model is used to estimate different sets of attitudes and beliefs. Therefore, oblique factor rotation by using the oblimin criterion was applied because this procedure allowed correlations among factors.

Confirmatory Factor Analysis

CFA was carried out to examine the validity of the hypothesized 2-factor model, including the 14 items obtained in the initial factor analysis on the German version of the PABS-PT.[6] The hypothesized model included two latent or common factors and 14 measured items, with 10 items loading on factor 1 labeled as "biomedical" (items 25, 31, 23, 10, 30, 26, 35, 4, 5, and 14), and 4 items loading on factor 2 labeled as "biopsychosocial" (items 34, 29, 19, and 11). The model fit was assessed by applying the chi-square test statistic and the comparative fit index (CFI). The chi-square test statistic, which was the primary test for the model, describes the difference between the measured covariance matrix and the model covariance matrix. The fit of the model was considered good if the chi-square test statistic was not significant (>0.05).[19] The CFI describes the extent to which the data are better fitted to the hypothesized model than to the baseline model (null model). CFI values close to 1.0 indicate a virtually perfect fit of the data to the hypothesized model. The criteria for a good model fit were defined according to Hu and Bentler[20], with CFI values of 0.95 or greater indicating a good model fit.

2.4. Results

Questionnaires from 358 general physiotherapists (33.6%) and 80 physiotherapy students (72.1%) were returned. Forty questionnaires were excluded from later analysis due to missing responses for >10% of items on the PABS-PT (N = 36) or due to physiotherapists self-reporting not regularly treating patients with LBP (N = 4). The final analysis thus included 398 questionnaires: 318 (79.9%) from general physiotherapists and 80 (20.1%) from physiotherapy students. Questionnaires from 371 (93.2%) participants had no missing values on the PABS-PT.

The majority of the 318 general physiotherapists were female (N = 219, 68.4%), worked in private physiotherapy practices (N = 280, 88.1%), and specialized in manual therapy (N= 232, 72.5%). The mean (SD) age of the general physiotherapists was 44.7 (10.3) years, and their mean (SD) length of experience in treating patients with LBP was 18.9 (10.3) years. The physiotherapy students had a mean (SD) age of 24.0 (2.7) years and were predominantly female (90%). Table 2 shows the characteristics of the study participants. Table 3 presents the descriptive statistics for all the PABS-PT items.

Table 2: Characteristics of Participants Included for the Analysis (N = 398)

Characteristics	**General PT**	**Student PT**
N:	318	80
Gender: female (%)	219 (68.4)	72 (90.0)
Age: mean (SD)	44.7 (10.3)	24.0 (2.7)
Years of experience in LBP management: mean (SD)	18.9 (10.3)	N/A
Frequency of patients with LBP in clinic: n (%)		N/A
One per day	257 (80.3)	
One per week	57 (17.8)	
One per month	4 (1.3)	
Work setting: N (%)		N/A
Private practice	280 (88.1)	
Hospital	29 (9.1)	
Rehabilitation centre	6 (1.9)	
Others	3 (.9)	
Specialisation in LBP management: n (%)[1]		N/A
Manual Therapy	232 (72.5)	
McKenzie	47 (14.7)	
Others	54 (16.9)	
No specialisation	57 (17.8)	

PT = physiotherapy/physiotherapist; N = sample size; LBP = low back pain; SD = standard deviation; N/A = not applicable; [1]multiple answers possible.

Table 3: Descriptive Statistics of the 36-Item Pool (N = 398)

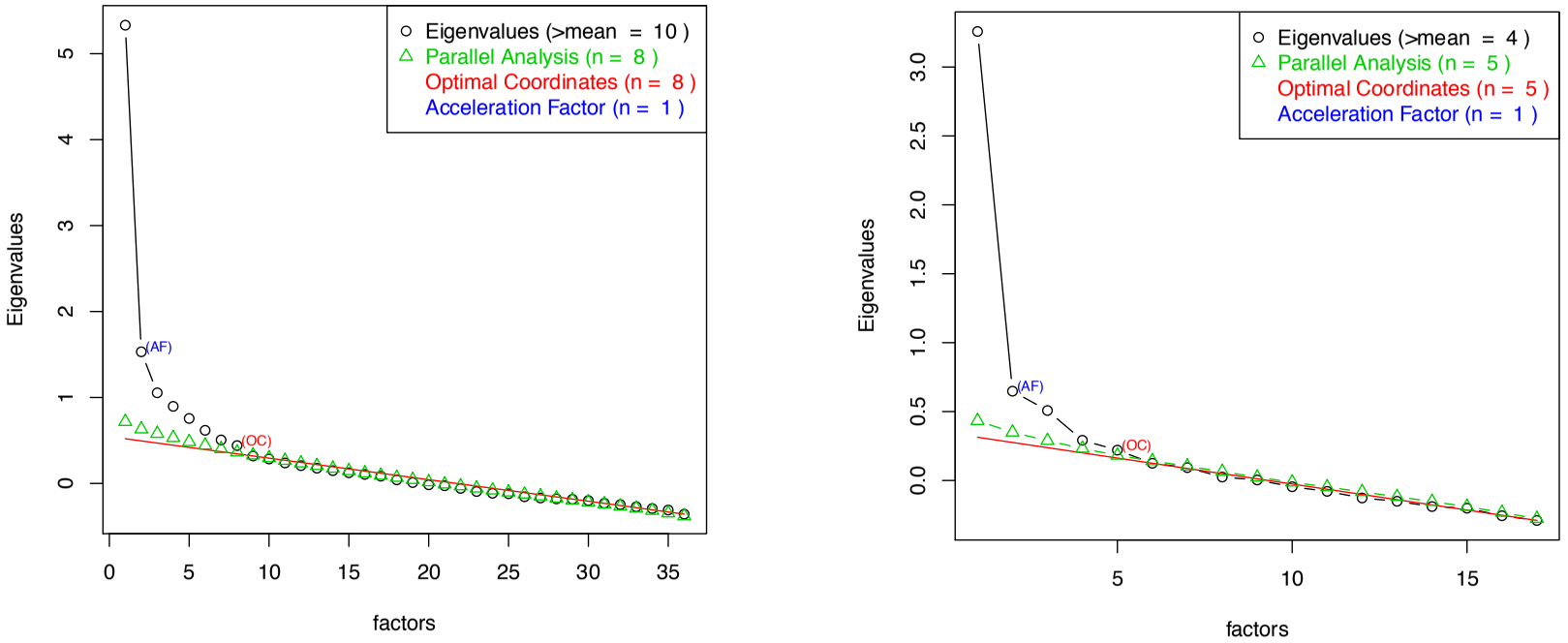
Nr.	Statement	M	SD	skew	kurt
1	Back pain sufferers should refrain from all physical activity in order to avoid injury	1.6	.90	1.64	2.49
2	Good posture prevents back pain	4.5	1.11	-1.05	1.44
3	Knowledge of the tissue damage is not necessary for effective therapy	2.4	1.34	.77	-.34
4	Reduction of daily physical exertion is a significant factor in treating back pain	2.6	1.18	.34	-.81
5	Not enough effort is made to find the underlying organic causes of back pain	3.3	1.31	.17	-.77
6	Mental stress can cause back pain even in the absence of tissue damage	4.6	1.14	-.87	.83
7	The cause of back pain is unknown	2.8	1.21	.20	-.88
8	Unilateral physical stress is not a cause of back pain	2.4	1.22	.84	.10
9	Patients who have suffered back pain should avoid activities that stress the back	2.5	1.13	.46	-.64
10	Pain is a nociceptive stimulus, indicating tissue damage	3.2	1.23	-.28	-.77
11	A patient suffering from severe back pain will benefit from physical exercise	4.0	1.20	-.48	-.20
12	Functional limitations associated with back pain are the result of psychosocial factors	3.2	1.21	-.25	-.75
13	The best advice for back pain is: “Take care” and “Make no unnecessary movements”	1.9	.92	.99	.89
14	Patients with back pain should preferably practice only pain free movements	3.6	1.19	-.25	-.76
15	Back pain indicates that there is something dangerously wrong with the back	2.3	1.07	.63	-.41
16	The way patients view their pain influences the progress of the symptoms	5.3	.77	-1.08	1.80
17	Therapy may have been successful even if pain remains	4.9	1.04	-1.12	1.63
18	Therapy can completely alleviate the functional symptoms caused by back pain	4.8	1.13	-1.14	1.27
19	If ADL activities cause more back pain, this is not dangerous	3.2	1.32	.23	-.80
20	Back pain indicates the presence of organic injury	2.6	1.16	.17	-1.00
21	Sport should not be recommended for patients with back pain	1.8	.87	1.07	.65

22	If back pain increases in severity, I immediately adjust the intensity of my treatment accordingly	5.0	1.00	-.90	.62
23	If therapy does not result in a reduction in back pain, there is a high risk of severe restrictions in the long term	3.4	1.33	-.18	-.87
24	Pain reduction is a precondition for the restoration of normal functioning	4.0	1.36	-.57	-.50
25	Increased pain indicates new tissue damage or the spread of existing damage	2.9	1.16	.17	-.74
26	It is the task of the physiotherapist to remove the cause of back pain	2.9	1.30	.23	-.83
27	There is no effective treatment to eliminate back pain	2.1	1.14	1.09	.72
28	TENS and/or back braces support functional recovery	3.2	1.33	-.11	-.99
29	Even if the pain has worsened, the intensity of the next treatment can be increased	4.4	1.07	-.71	.51
30	If patients complain of pain during exercise, I worry that damage is being caused	2.6	1.11	.52	-.21
31	The severity of tissue damage determines the level of pain	2.5	1.34	.57	-.84
32	A rapid resumption of daily activities is an important goal of the treatment	5.3	.88	-1.78	4.36
33	Learning to cope with stress promotes recovery from back pain	5.0	.86	-.62	.74
34	Exercises that may be back straining should not be avoided during the treatment	4.7	1.04	-.74	.56
35	In the long run, patients with back pain have a higher risk of developing spinal impairments	3.4	1.41	-.14	-.86
36	In back pain, imaging tests are unnecessary	2.8	1.31	.20	-1.00

N = sample size; M = mean; SD = standard deviation; skew = skewness; kurt = kurtosis.

Higher scores on the PABS-PT items represent strong agreement with the statement. The Likert-type responses ranged from 1 = totally disagree, to 6 = totally agree.

Figure 1: Solutions for the Factor Retention Decision from EFA on the PABS-PT. The Graph on the Left Showing Solutions from EFA on the 36-Item PABS-PT, and the Graph on the Right Showing Solutions from EFA on the 17-Item Pool.



OC = optimal coordinates; AF = acceleration factor; eigenvalues estimated from the *reduced* correlation matrix.

The graphs show computed eigenvalues from the reduced correlation matrix plotted in descending order. Results from the four methods used for the factor retention decision illustrate that no method suggested to specify a 2-factor model on the different pools of PABS-PT items.

EFA on the 36-item PABS-PT Scale

The KMO test value was 0.83, indicating that the correlation matrix was adequate for factor analysis. The mean eigenvalue of the 36 vectors (items) derived from the reduced correlation matrix was 0.239 (range = -0.357 to 5.332). The Kaiser criterion (eigenvalue > mean eigenvalues) suggested the extraction of 10 factors (k = 10). The eigenvalues of these factors were: 5.332, 1.532, 1.055, 0.897, 0.756, 0.618, 0.506, 0.440, 0.319, and 0.284, with the next lower eigenvalue being 0.238. Parallel analysis and optimal coordinates both suggested the extraction of eight factors (k = 8). In the likelihood ratio test, only when k = 8 was the null hypothesis "k factors are sufficient" not rejected (p = 0.05). Figure 1 (left) presents a graphic summary, including the eigenvalues computed from the *reduced* correlation matrix. The scree plot included one very large eigenvalue and a second potential common factor. However, the acceleration factor showed the elbow of the curve on the second eigenvalue, indicating the extraction of only one factor. Parallel analysis, optimal coordinates, and the likelihood ratio test identified eight common factors. For the suggested 8-factor model, the pattern matrix after oblique rotation showed a large factor 1 with significant loadings (>0.30) to 8 measured PABS-PT items (25, 10, 31, 15, 20, 24, 26, and 30). The descending factors included several negative loadings to measured items and several PABS-PT items were not influenced by the identified common factors.

EFA on the 17-item Pool

The KMO test value of the 17 items was .83. The mean eigenvalue of the 17 vectors (items) derived from the *reduced* correlation matrix was 0.226 (range = -0.290 to 3.258). The Kaiser criterion (eigenvalue > mean eigenvalues) suggested the extraction of four factors (k = 4). The eigenvalues of these factors were: 3.258, 0.648, 0.508, and 0.2918, with the next lower eigenvalue being 0.220. Figure 1 (right) shows the scree plot of the eigenvalues computed from the reduced correlation matrix. This pattern of eigenvalues is similar to the previous scree plot from 36 items indicating one very large eigenvalue. Similar to the previous scree plot, the acceleration factor identified the elbow of the curve on the second eigenvalue, suggesting that one factor be retained. Parallel analysis and optimal coordinates both suggested specifying a 5-factor model. Furthermore, in the likelihood ratio test, only when k = 5 was the null hypothesis "k factors are sufficient" not rejected (p = 0.16). For the specified 5-factor model, the pattern matrix after oblique rotation showed a factor 1 with four significant loadings (>0.30) to the measured items (31, 25, 10, and 26).

CFA Testing the Fit of the Hypothesized 2-Factor Model

For the predefined 2-factor model consisting of the selected 14 items, which matched the two common factors identified in the previous validation study,[6] the chi-square test statistic was significant (*p*-value = 0.000), indicating a poor fit of the hypothesized 2-factor model from the initial validation study.[19] Additionally, the CFI value was 0.888, which was below the predefined cutoff (>0.95) for a good model fit.[20]

2.5. Discussion

This study replicated the initial validation study on the German PABS-PT to reexamine the factor structure of the questionnaire.[6] EFA and CFA were conducted on different item pools to examine the underlying structure of the scale and to test the fit of the hypothesized 2-factor model of the German PABS-PT. Our findings from EFA and CFA do not support the validity of the 2-factor model that was previously considered as an adequate representation of the German PABS-PT. The results of our study are inconsistent with those of the previous validation on the German PABS-PT,[6] and also differ from other factor analyses on the measurement scale.[1-5] Thus, the results may indicate a need for caution in using the PABS-PT to measure physiotherapists' orientation towards LBP, particularly for testing the magnitude of their biopsychosocial orientation.

The aim of our study was to replicate the previous validation study on the German PABS-PT. Therefore, we recruited study participants similar to those in the initial study.[6] Both samples consisted of general physiotherapists, mainly specializing in manual therapy, along with undergraduate physiotherapy students. Although the number of participants included in the analysis was larger in our study (N = 398 vs 274), the overall response rate was lower (37 vs 79%) compared with the study of Laekeman et al.[6] Nevertheless, we consider the characteristics of participants in these two validation studies to be comparable.

Inconsistencies in the performance of the measurement scale were found between the present and the previous validation of the German language version.[6] Laekeman et al[6] excluded 14 measured items from EFA because of a skewness exceeding ±1.0.[6] We found only eight items that met this criterion (see Table 3). Indeed, inconsistencies in the performance of the PABS-PT items could be expected because of differences in the number of items excluded from EFA across other studies (see Table 1). The performance of the scale indicates that the German 36-item PABS-PT includes several items that should be revised or discarded from the scale. Furthermore, the results of EFA on the 36-item scale estimated the factor structure of the measurement scale that was used in the present, and in previous, factor analyses of the PABS-PT.[1-4,6] Overall, results from the

German 36-item PABS-PT indicates that a 2-factor model may not describe the underlying structure of this scale and that the 36-item scale should be revised.

Previous validation studies of the PABS-PT selected different items for factor analyses to uncover the underlying relationships between latent common factors and measured items.[1-4,6] The previous validation study on the German PABS-PT included 17 items for EFA and identified two common factors, but these two factors influenced only 14 PABS-PT items. In our study, we replicated EFA on the same 17-item pool, but no method for determining the number of factors to retain suggested retaining only two factors for the final model. The scree plot of the 17 eigenvalues indicated one large factor that might be consistent with the factor 1 "biomedical" factor in other studies.[1-6] This factor seemed to be quite robust regarding the number of significant loadings to the measured items. However, our results do not indicate the validity of a 2-factor model of the German PABS-PT. The negative results of the CFA further support the proposal that a 2-factor model does not fit the selected PABS-PT items. Therefore, while the PABS-PT may include a biomedical factor that relates to items of the scale, our findings do not support the assumption that the PABS-PT includes one additional biopsychosocial factor.

Previous EFA studies of the PABS-PT applied problematic methods for determining the number of factors to retain. These studies used several different methods; however, the final decision of the researchers to specify a 2-factor model was based on the graphic scree test.[3,4,6] For example, in the EFA study on the Norwegian PABS-PT, parallel analysis suggested the extraction of four factors.[2] The authors, however, retained only two factors based on the examination of the scree plot. Parallel analysis is considered as an objective and adequate method in EFA.[18,21,22] In contrast, the graphic scree test has been criticized because of its subjectivity.[18,23] Errors in the selection of the number of factors in a model can have substantial effects on the results obtained from EFA.[24] EFA provides several different methods for determining the number of factors that should be included in the model. However, the factor analysis approach is primarily data-driven.[25] Therefore, decisions on the number of factors to retain should be based on objective methods such as parallel analysis.

Limitations of the present study include the low response rate, which might be explained by the strategy used to distribute the questionnaire, whereby contact details were derived from an online database without any personal contact between the researchers and the participants. The low response rate limits the conclusions that can be drawn from this validation study, since it might have led to a sampling bias because physiotherapists with a strong biomedical treatment orientation might not have responded to the invitation to take part in the survey.[6] Another limitation might be the inclusion of students in this study. Students have very limited experience in managing patients

with LBP. This could have influenced the performance of the PABS-PT in our study. However, in doing this we accurately replicated the previous validation study of the German PABS-PT which included undergraduate physiotherapy students. Additionally, this study did not include a comparison with other related measurements. Testing the correlation between the PABS-PT and another valid measurement of a theoretically similar construct would have allowed conclusions regarding the convergent validity of the PABS-PT. Further tests on the construct validity and criterion validity of the scale would benefit further development of the questionnaire.

The results of this study indicate that caution should be applied when using the PABS-PT to test the treatment orientation of healthcare providers towards LBP, particularly the magnitude of a biopsychosocial orientation. Some items of the PABS-PT might be adequate to measure aspects of a biomedical orientation. These biomedical items could be used in future research to establish cut-off scores for identifying individuals with a strong biomedical orientation. The multifactorial structure of the PABS-PT may also indicate that a biopsychosocial orientation of healthcare provider cannot be captured by a single common factor. The dimensionality, or components, of a biopsychosocial orientation toward LBP would be interesting to explore further in future research. Additionally, it would be relevant to investigate how behavioral and affective dimensions relate to physiotherapists' attitudes and beliefs. According to the tripartite model of attitudes, attitudes have distinct cognitive, affective and behavioral components.[26,27] It is likely that the content validity of the PABS-PT can be improved by developing more items that capture the affective and behavioral components of attitudes. Furthermore, it might be interesting to explore how or whether components of a biopsychosocial orientation can be observed in the behavior of physiotherapists in clinical practice. Having a suitably robust measure of the PABS-PT and similar scales is necessary given the potential of such scales to assess the beliefs and attitudes of clinicians toward influencing their clinical behavior and patient outcomes. Further work is therefore needed to revise and enhance the PABS-PT.

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Declaration of Interest

The authors declare no conflict of interest.

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3. Comparison of Clinical Vignettes and Standardized Patients as Measures of Physiotherapists' Activity and Work Recommendations in Patients with Non-Specific Low Back Pain (Study 2)

Emanuel Brunner[1,2], Michel Probst[1], André Meichtry[2], Hannu Luomajoki[2], Wim Dankaerts[3]

[1] Adapted Physical Activity and Psychomotor Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[2] Institute of Physiotherapy, School of Health Professions, Zurich University of Applied Sciences, Winterthur, Switzerland

[3] Musculoskeletal Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

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3.1. Abstract

Objective. To validate clinical vignettes as measure of physiotherapists' activity and work recommendations given to patients with non-specific LBP (LBP).

Design. Validation study comparing two methods for measuring aspects of health providers' clinical management: clinical vignettes and unannounced visits of standardized patients (the gold standard).

Setting. Outpatient physiotherapy clinics

Subjects. Physiotherapists who consented to see unannounced standardized patients in their clinical practice.

Main measures. Clinical vignettes were used to initially measure physiotherapists' self-reported activity and work recommendations. Subsequently, actors performing as standardized patients visited physiotherapists in their clinical practice and rated the advice given by the physiotherapist regarding activity and work. Totally, 23 standardized patients were randomly scheduled to physiotherapists. Physiotherapists were blinded towards the standardized patients. To test whether standardized patients were detected, physiotherapists reported if they suspected that they had treated an actor.

Results. Standardized patients (N = 23) visited 22 different physiotherapists. Physiotherapists detected 12 out of 23 unannounced standardized patients. The estimated agreement between the two measures was poor, for both activity and work recommendations (weighted kappa coefficients: 0.29 resp. -0.21).

Conclusion. The poor concordance between clinical vignettes and standardized patients indicates the potentially limited validity of clinical vignettes as measure of health providers' activity and work recommendations in LBP practice.

3.2. Introduction

Large efforts have been expended for measuring health providers' clinical management of patients with non-specific LBP. Previous studies aimed to measure clinical practice for testing health providers' adherence to clinical guidelines, and particularly for investigating the association between their attitudes and beliefs towards back pain and their clinical management.[1-14] Most of these studies used clinical vignettes for measuring health providers' clinical behaviour. Clinical vignettes are written case scenarios presenting fictitious patients, and respondents are then asked to report what their behaviour would be.

The validity of this self-reported method of measurement is questionable but remains unclear.[15,16] There is uncertainty, whether clinical vignettes reflect actual clinical practice or merely competence of what health providers are knowledgeable enough to do.[17,18] Rutten et al.[4] tested clinical vignettes against recording forms, another measurement of self-reported clinical behaviour, but vignettes have never been tested against more objective or direct methods for measuring LBP practice.

Standardized performances of simulated patients might be a promising method for measuring health providers' clinical management in LBP practice. In this methodology, trained actors perform as standardized patients for capturing health providers' behaviour in real clinical practice. Unannounced visits of standardized patients are considered as the gold standard method for measuring therapist-patient interaction in clinical practice.[17-20] The major advantage of this method is that it protects against response bias due to social desirability, since the standardized patients present as actual patients in clinical practice. To the author's knowledge, unannounced visits of standardized patients have never been used for measuring health providers' clinical management of patients with non-specific LBP.

Therefore the primary aim of this study was to estimate the agreement between ratings from clinical vignettes and unannounced visits of standardized patients for investigating the validity of clinical vignettes as measure of health providers' activity and work recommendations.

3.3. Materials and Methods

Procedure and Sample

Physiotherapists (N = 59) from six different outpatient clinics were recruited for participation. In total, 23 visits of standardized patients were conducted during eight months. Standardized patients were randomly scheduled to physiotherapists. After signing informed consent, physiotherapists filled out the clinical vignettes, and the first unannounced visit of a standardized patient was scheduled at the earliest six weeks later. The study received approval by the regional ethics committee. *(Addendum 1: see pg. 58)*

Clinical Vignettes

Physiotherapists received five clinical vignettes, but only one vignette was used as a measure of self-reported clinical management. The vignette #2 developed by Rainville et al.[21] was selected, because this case scenario was frequently used in previous studies. Laekeman et al.[22] provided the German translation of the clinical vignette for the use in this study. Physiotherapists were not informed that only one clinical vignette was included for the analysis. The selected vignette describes a female patient with a history of four years of mild LBP and multiple exacerbations each year. Further characteristics were; increase of symptoms, absences from work due to pain for the last month, no neurological deficits on physical examination and unremarkable imaging studies.[21] Psychosocial factors such as pain cognitions and behaviours were not described in the clinical vignette. Based on a short description, physiotherapists were first asked regarding patient's symptoms and pathology. In the last two questions, physiotherapists were asked to report what they would recommend the patient regarding activity and work. For activity recommendation, the following five response categories were possible:

Recoding by authors:

Not limit any activities	no avoidance
Avoid only painful activities	partial avoidance
Limit activities to moderate exertion	
Limit activities to light exertion	
Limit all physical activities	full avoidance

The authors subsequently recoded the five responses categories from the original scales for activity and work recommendations into three categories: no avoidance, partial avoidance and full avoidance. For work recommendations, the two extreme categories were; 1 = 'work full time' (recoded: no avoidance) and 5 = 'do not work' (recoded: full avoidance). The statistical analysis estimating the agreement between the two measures was based on the three recoded response categories.

Unannounced Visits of Standardized Patients

Three professional actors (two men) were used as standardized patients. They were between 40 and 49 years old and had between six and eight years of experience in performing as standardized patient within educational programmes. They had no previous experience in unannounced visits in clinical practices. The standardized patients contacted the clinics by phone to make an appointment for the first session. Office managers, but not the clinic personnel involved in scheduling, were instructed about the study protocol and supervised the allocation of standardized patients. *(Addendum 2: see pg. 58)*

Creating Case Scenarios of Standardized Patients

All cases were based on the same clinical vignette, case #2 developed from Rainville et al.[21] For each actor specific cases scenarios were created. The cases varied in gender, occupation and family situation. For representing an actual patient, additional details were added to the vignette. Standardized patients represented patients with a profile of psychosocial risk factors, such as: catastrophizing, avoidance behaviour and depressive mood. In order to prevent the detection of standardized patients by the physiotherapists or clinic personnel, fake identities were created for all 23 cases including names, addresses, health insurance numbers and referral forms from different medical doctors.

Ratings of Standardized Patients

Immediately following the initial treatment session, the actors rated physiotherapists' activity and work recommendations with a standardized patient evaluation form, which was based on the five answer categories of the clinical vignettes. But for the standardized patient evaluation forms, one additional category was added; 'not clear'. The actors were instructed to rate 'not clear' if they perceived the physiotherapist's advice as unclear or confusing. The authors subsequently recoded ratings of the standardized patients with the rule used for recoding ratings from clinical vignettes.

Additionally to the ratings regarding activity and work recommendation, actors reported the duration of the treatment session and their general impression of the therapy session.

Detection of Standardized Patients

If physiotherapists suspected that an actor consulted them, they were asked to report this suspicion directly after the treatment. Blinding of physiotherapists towards standardized patients was rated as successful if no suspicion was reported within 24 hours after the visit. Reports were rated as false-positive, if physiotherapists reported their suspicion within the defined period but the mentioned patient was in fact a real patient.

Training of Standardized Patients

The actors had a six hours training session prior to their first unannounced visit as standardized patient. The training was led by the study principal author (E.B.) together with a standardized patient trainer who had over three years of experience in the training of standardized patients for clinical skills teaching. Actors were trained in presenting illness history, medical and personal histories, physical findings, postures, movement patterns, psychological factors and expressions of concerns about their current problem. They were instructed to follow the physiotherapist's lead and communication style, and to be reluctant to talk about their psychological distress. It was further encouraged to ask the physiotherapist for advice regarding pain-related activities and their opinion on their ability to work and sick listing. During the first training, one treatment session with an experienced physiotherapist was conducted. The actors were extensively trained in using the standardized patient rating scales for ratings of work and activity recommendations. Therefore, videos of treatment sequences were presented to the actors, representing each possible score of the standardized patient evaluation form. Following the fifth standardized patient visit, each actor participated in a refresher training lasting three hours.

Clinical Setting

Six outpatient physiotherapy practices (all located in Switzerland) participated in this study. In the Swiss health care system, only medical doctors are permitted to decide regarding working ability and sick listing of the patient. However, physiotherapists are often asked for advice regarding activity and work abilities.

Statistical Analysis

Weighted kappa coefficients were calculated for estimating the agreement between clinical vignettes and standardized patient scales.[23] Weighted kappa coefficients are a sum of the weighted frequencies corrected for chance[24] While Cohen's kappa is based on agreement, weighted kappa is based on weighted disagreements. We used squared weights. If this quadratic weighting scheme is used ($0, 1^2, 2^2$), the weighted kappa is approximately equivalent to the widely used agreement-version of the intra-class correlation coefficient (ICC) derived from a two-way random model.[25] The maximum value of weighted kappa is 1.0, when ratings of the two scales are identical, representing perfect agreement. For defining the criteria for the magnitude of weighted kappa, we used the cut-off values proposed by Streiner & Norman: poor = <0.00 to 0.40; fair to good = 0.41 to 0.75; excellent = >0.75.[24] Cases with the scores 'not clear' on the standardized patients scales were excluded from the analysis of the particular scale. First the overall agreement between vignette and standardized patients was estimated. In a second step, cases were split into two subsets, depending on whether the therapists detected the standardized patient or not. Point and interval estimations of weighted kappa (with alpha = 0.05) were performed. All statistical analyses were conducted with the psych package in R (R version 2.14.1).[26]

3.4. Results

Sixty-one physiotherapists were recruited for this study, and 59 (96.7%) participated and consented to see unannounced standardized patients in their clinical practice. The 23 standardized patients were randomly scheduled to 22 different physiotherapists. Characteristics of physiotherapists who were consulted by standardized patients (N = 22) are presented in Table 1. From the 23 unannounced visits, two actors performed 8 cases and one actor performed 7 cases. Duration of the treatment session was 30 minutes for 20 visits, and three visits of standardized patients lasted 60 minutes.

Table 1: Characteristics of Physiotherapists (N = 22) Visited by Standardized Patients

Characteristics	**Value**
Gender, female: n (%)	16 (72.7%)
Age, in years: mean (range)	32.5 (26-48)
Experience with LBP, in years: mean (range)	8.95 (1-45)
Training in LBP management: n (%)[a]	
Manual Therapy	13 (59.1)
McKenzie	2 (9.1)
Cognitive Behavioural Therapy	1 (4.5)
No specific LBP training	8 (36.4)
Work setting: n (%)	
Private practice	16 (72.7)
Hospital	6 (27.3)
Frequency of LBP patients in clinic: n (%)	
≥ 1 per day	15 (68.2)
1 per week	7 (31.8)

LBP = low back pain. [a] multiple answers possible.

Detection of Standardized Patients

Physiotherapists identified 12 out of 23 unannounced standardized patients (detection rate: 52%). The detection rate varied between actors. Those two actors performing eight standardized patient cases were identified during four respectively three visits (detection rate: 50 resp. 38%). The one actor performing seven cases was identified during five visits. When the treatment session lasted 60 minutes, all three standardized patients were detected. Five false-positive reports were noted, meaning that therapists suspected to have treated a standardized patient when it was in fact a real patient.

Therapeutic Recommendations

Ratings of physiotherapists' recommendations on clinical vignette and standardized patient scales are presented in Table 2 and Table 3. The frequency of ratings of physiotherapists' recommendation regarding activity did not differ substantially between the two measurements. On both clinical vignettes and standardized patient scales, six physiotherapists (26%) recommended not to limit activities. None advised full avoidance of activities. Three physiotherapists (13%) provided unclear or confusing information regarding activity to the standardized patients. Regarding work recommendation, eight physiotherapists provided unclear or confusing information towards standardized patients (35%). The percentage of physiotherapists recommending 'working full time, full duty' to patients was similar on both rating scales (39% resp. 48%). On clinical vignettes, none recommended not working, but two therapists (9%) recommended full avoidance to standardized patients.

Table 2: Frequency of Ratings (N = 23) of Physiotherapists' **Activity** Recommendations Measured with Clinical Vignettes and Standardized Patients

		Ratings from CV					Totals:	
	Response categories	[1]	[2]	[3]	[4]	[5]	(n)	(%)
Ratings from SP	[1] not limit any activities	**3**	3				6	26
	[2] avoid only painful activities	1	**6**		1		8	35
	[3] limit activities to moderate	1	3	**1**			5	22
	[4] limit activities to light exertion	1					1	4
	[5] limit all physical activities						0	0
	[nc] not clear [a]	1	2				3	13
	Totals (n):	7	14	1	1	0	**23**	
	Totals (%):	31	61	4	4	0		**100**

Cases (n, %) with perfect agreement between CV and SP = 10 (50%)[b]

SP = standardized patients; CV = clinical vignettes.

[a] response category added to scale on standardized patient form; [b]cases with the ratings 'nc' on standardized patient rating scale were exclude.

Table 3: Frequency of Ratings (N = 23) of Physiotherapists' **Work** Recommendations Measured with Clinical Vignettes and Standardized Patients

		Ratings from CV					Totals:	
	Response categories	[1]	[2]	[3]	[4]	[5]	(n)	(%)
Ratings from SP	[1] work full time, full duty	**5**	4	2			11	48
	[2] work moderate duty, full time		**1**				1	4
	[3] work light duty, full time						0	
	[4] work light duty, part time		1				1	4
	[5] remain out of work	2					2	9
	[nc] not clear [a]	2	4	2			8	35
	Totals (n):	9	10	4	0	0	**23**	
	Totals (%):	39	43	17	0	0		**100**

Cases (n, %) with perfect agreement between CV and SP = 6 (40%)[b]

SP = standardized patients; CV = clinical vignettes.

[a] response category added to scale on standardized patient form; [b]cases with the ratings 'nc' on standardized patient rating scale were exclude.

Table 4: Weighted Kappa Coefficients Between Clinical Vignette and Standardized Patient Scales for Physiotherapists' Activity and Work Recommendations[a]

	Clinical vignettes	
	Activity	Work
Standardized patients		
Overall:		
Activity (n = 20)	.29 (-.16 to .74)	
Work (n = 15)		-.21 (-.61 to .19)
Subset: SPs not detected		
Activity (n = 10)	.20 (-.36 to .76)	
Work (n = 8)		-.21 (-.60 to .18)
Subset: SPs detected		
Activity (n = 10)	.41 (-.18 to 1.00)	
Work (n = 7)		.13 (-.15 to .40)

Agreement estimates with weighted kappa coefficients (95% Confidence Interval); cases with the ratings [nc] = 'not clear' on standardized patient response scales were excluded from analysis.

[a] The analysis of estimated agreement based on recoded ratings with 3 response categories: 'no avoidance', 'partial avoidance' and 'full avoidance'.

Agreement Between Clinical Vignettes and Standardized Patients

Tables 2 and 3 indicate that 50% of cases had perfect agreement between ratings of clinical vignettes and standardized patients, and 40% of cases regarding work recommendations. The recoding of the original response scales into three categories increased the percentage of agreement to 70% for activity respectively to 47% for work recommendations.

Table 4 presents the weighted kappa coefficients as estimation of agreement between ratings of the two measures when corrected for agreement occurring by chance. Poor overall agreement was found between ratings of the two measures for activity recommendations (weighted kappa (Kw) = 0.29) and work recommendations (Kw = -0.21). The strongest agreement was found for activity recommendations in the subset of physiotherapists that detected the standardized patients during treatment (Kw = 0.41), while this agreement was poor when the standardized patients were not identified (Kw = 0.20). For work recommendations, the agreement between ratings from clinical vignettes and standardized patients was poor (-0.21 resp. 0.13) for both subsets.

3.5. Discussion

Experienced physiotherapists identified approximately 50% of standardized patients in their clinical practice, and furthermore identified some real patients as actors. Our findings reveal low concordance between self-reported therapeutic recommendations measured with clinical vignettes and advice given to similar patients in real clinical practice.

This was the first study using unannounced visits of standardized patients for measuring aspects of non-specific LBP practice in a physiotherapy setting. Results reveal challenges in using standardized patients in a physiotherapy setting. The main concern is related to the blinding of physiotherapists. The rate of detected standardized patients was higher in our study than in comparable studies conducted in general practitioner practices and in pharmacies.[27-29] In these studies, detection rates were not higher than five per cent. The high detection rate found in our study might be explained by differences in the clinical setting. Our physiotherapy sessions lasted at least 30 minutes. There was hypothetically more time for interaction between physiotherapists and standardized patients, compared with studies conducted in general practice and pharmacies. Longer treatment sessions are potentially more stressful for standardized patients and increase the chance of detection. The finding that all standardized patients were recognized when the therapist-patient interaction lasted 60 minutes supports this assumption.

Additionally, presentation of pain-related postures, movements and activities is of particular importance in physiotherapy. Our standardized patients reported that these tasks were more challenging than the communicative interaction. Therefore, the methodology of unannounced visits of standardized patients might be more suitable in settings where communication tends to be the primary focus of the consultation. Additionally, the high rate of detected standardized patient may also be related with the training of the actors. We trained them for approximately eight hours during two meetings. Siminoff et al.[18] reported in their study protocol that they have trained the standardized patients during three days before the first unannounced visit in general practices. Other studies did not precisely report the duration of standardized patient training.[27-29] Generally, training of standardized patients is very costly and time consuming, but nevertheless we suggest more intensive training of standardized patients in future research.

The estimated overall agreement between ratings of clinical vignettes and standardized patients was poor for activity and work recommendations (see Table 4). The poor agreement found in our study is in contrast with results from other standardized patient studies testing quality of care in general practitioner practice.[17,27] Indeed, previous studies concluded that the use of vignettes had acceptable validity. However, translating these results into the context of our research might be problematic. Peabody et al.[17,27] used clinical vignettes for investigating quality of care and not specifically for testing aspects of therapeutic communication. Clinical vignettes, with their static nature, might be more appropriate for measuring clinical encounters such as physical examinations, drug prescriptions and referrals, or for verifying the correctness of a diagnosis, than for capturing therapeutic communication as part of the intervention.

Interestingly, the agreement between the two methods regarding activity recommendations was stronger when physiotherapists identified the standardized patients (Kw = 0.41) than when they were blinded (Kw = 0.20). This difference in estimated agreement may support the hypothesis that clinical vignettes are a measurement of knowledge or competence about non-specific LBP management rather than a measure of health providers' actual behaviour in clinical practice.[17,27] Siminoff et al.[18] mentioned a potentially high threat of response bias in measurements of clinical vignettes due to social desirability, meaning that responders answer in a manner they perceived as desirable. The social desirability bias may have affected ratings of physiotherapists' therapeutic advice in clinical vignettes to the same extent as in ratings from standardized patients when they identified the simulated patient.

The potential effect of the detection of standardized patient was not found in work recommendations. This contrast to activity advice may relate to the specific clinical setting of our study. Like in the day-to-day clinical practice, participating physiotherapists were not responsible for decisions regarding work ability. Consequently, their routine and awareness for providing advice regarding work might be lower than for advising individuals on their suitable activity levels. This may result in more variability and low agreement between repeated measurements. The relatively high frequency (35%) of unclear or confusing recommendations regarding work is in line with this assumption.

The clinical vignettes and standardized patients may also have measured two different constructs. The written case scenario used in this study was rather short and provided limited information about patient's personal characteristics and psychological factors. We needed to add additional characteristics to the clinical vignette for developing the standardized patient cases. The more detailed and complex nature of the standardized patient cases points at the methodological limitation of clinical vignettes. Written case scenarios are limited in simulating the whole complexity of the therapist-patient interaction in real clinical practice, where health providers' behaviours might be influenced by factors such as personal or psychological characteristics of the patient and the clinical setting. The poor overall agreement between the clinical vignette and the standardized patients found in our study may support the assumption that clinical vignettes are of limited validity for measuring health providers' therapeutic recommendation in non-specific LBP practice.

Our study has limitations. The sample size was relatively small. Calculating weighted kappa coefficients for estimating the agreement between the two measures does not require a minimum number of observations. However, conducting more standardized patient visits would have resulted in a higher precision of estimates of agreement between the two measurements. The number of unannounced visits of standardized patients was limited due to logistic reasons and the number of trained actors. Repeated visits at the same clinic by the same actor increase the risk of detection of standardized patients. For future research, we recommend to train more actors for performing as standardized patients in real clinical practice.

Further, the response scales used in clinical vignette and standardized patients are problematic for rating therapeutic recommendations. We used the questions and response categories from the vignettes developed by Rainville et al.[21] in order to optimize the comparability of the two ratings. The rank of the original five response categories is questionable and the discrepancies between items differ significantly within the scale. For example, the discrepancy between 3 = limit activities to moderate exertion and 4 = limit activities to light exertion is smaller than between 4 and 5 = limit all activities. We aimed to address this limitation by recoding

responses from physiotherapists into three categories with a more clearly ranked order: 'no avoidance', 'partial avoidance' and 'full avoidance'. The amalgamation of response categories increased the agreement between ratings of standardized patients and clinical vignettes, but the agreement remained low and did not distort interpretation of results. However, conclusions regarding aspects of health providers' therapeutic communication may require the measurement of multiple dimensions of communication.

Another limitation in our study might be associated with the variability between ratings of standardized patients. The standardized patients rated physiotherapist's recommendations immediately following the initial treatment session. The reliability of these ratings is unknown. But we aimed to reduce potential inter-rater variability by employing highly experienced professional actors. They were all experienced in evaluating clinical skills within educational programmes, and they were also extensively trained in using the standardized patient rating scales prior the first visit. *(Addendum 3: see pg. 58)*

However, it could be argued that obtaining audio recordings with concealed voice recorders during interventions, and the subsequent coding and analysis of verbal communication might improve the reliability of ratings of standardized patients. Similar procedures were indeed used in previous standardized patient studies.[28-30] We decided not to use concealed recorders, in order to increase participants anonymity and for maximizing participation rates. However, based on findings and experiences of our study, we recommend using concealed voice recorders in future standardized patient studies.

Conclusion

Using unannounced visits of standardized patients in physiotherapy practice is highly challenging, mainly regarding the high risk that physiotherapists identify the simulated patients. The estimated poor agreement between ratings of clinical vignettes and standardized patients indicate the potentially limited validity of clinical vignettes as measure of health providers' clinical behaviour in non-specific LBP practice.

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Competing Interests

The authors declare that there is no conflict of interest

Addenda to: *Clin Rehabil (2016) 30(1):85-94. doi: 10.1177/0269215515570499.*

Addendum 1: Procedure and Sample (pg. 47). Participating physiotherapists were informed that the study aimed to test the applicability of standardized patients in physiotherapy practice, and whether physiotherapists can detect actors in their practice. No further information on the study objectives was communicated.

Addendum 2: Unannounced Visits of Standardized Patients (pg. 48). The content of this intake session was at the therapist's discretion. Visits of standardized patients in physiotherapy practices could have included a patient interview, physical examination, and demonstrations of pain-related movements and activities.

Addendum 3: Limitations (pg. 57). The background of the actors (e.g. attitudes and beliefs regarding LBP) was unknown. This limitation might be important because actors' characteristics could have influenced their ratings of physiotherapists' therapeutic recommendation.

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PART II - Physiotherapists' Ability to Identify and Address Psychological Factors (Study 3)

4. Physiotherapists' Ability to Identify psychological factors and Their Self-Reported Competence to Manage Chronic Low Back Pain (Study 3)

Emanuel Brunner[1,2], Wim Dankaerts[3], André Meichtry[4], Kieran O'Sullivan[5,6], Michel Probst[1]

[1] Adapted Physical Activity and Psychomotor Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[2] Institute of Physiotherapy, Kantonsspital Winterthur, Winterthur, Switzerland

[3] Musculoskeletal Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[4] Institute of Physiotherapy, School of Health Professions, Zurich University of Applied Sciences, Winterthur, Switzerland

[5] Sports Spine Centre, Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar

[6] Department of Clinical Therapies, University of Limerick, Limerick, Ireland

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4.1. Abstract

Background. In the management of chronic low back pain (CLBP), identifying and dealing with more patients who are at high risk and who have psychological barriers to recovery is important yet difficult.

Objectives. The objective of this study was to test physiotherapists' ability to allocate patients into risk stratification groups, test correlations between therapists' assessments of psychological factors and patient questionnaires, and explore relationships between psychological factors and therapists' self-reported competence to manage patients with CLBP.

Design. This was a pragmatic, observational study.

Methods. Patients completed the STarT Back Tool (SBT, for risk stratification), the Four-Dimensional Symptom Questionnaire (distress, depression, anxiety), and the Tampa Scale of Kinesiophobia (kinesiophobia) prior to the intake session. After this session, physiotherapists estimated patient prognostic risk using the 3 SBT categories and rated patient psychological factors using a 0-to-10 scale. Finally, therapists reported their self-reported competence to manage the patient. Intraclass and Spearman rank correlations tested correlations between therapists' intuitive assessments and patient questionnaires. A linear mixed model explored relationships between psychological factors and therapists' self-reported competence.

Results. Forty-nine patients were managed by 20 therapists. Therapists accurately estimated SBT risk allocation in only 41% of patients. Correlations between therapist perceptions and patient questionnaires were moderate for distress ($r = 0.602$) and fair for depression ($r = 0.304$) and anxiety ($r = 0.327$). There was no correlation for kinesiophobia ($r = -0.007$). Patient distress was identified as a negative predictor of therapists' self-reported competence.

Limitations. This was a cross-sectional study, conducted in only 1 centre.

Conclusions. Physiotherapists were not very accurate at allocating patients into risk stratification groups or identifying psychological factors. Therapists' self-reported competence in managing patients was lowest when patients reported higher distress.

4.2. Introduction

Chronic low back pain (CLBP) is a complex and multidimensional health problem associated with a high personal and economical burden.[1-5] Psychological factors play an important role in the development and maintenance of CLBP.[6-8] Kinesiophobia, pain-related fear and depressive mood are predictors for developing persistent pain and disability.[7,9] Furthermore, comorbid mental illnesses are very common in patients with CLBP.[10,11] Therefore, it would seem appropriate for physiotherapists and other health care professionals managing chronic LBP patients to be able to identify psychological factors, with a view to enhancing outcomes.

Different patient questionnaires have been developed for the assessment of psychological factors associated with LBP. The STarT Back Tool (SBT) is a risk stratification instrument frequently used to help healthcare professionals in their initial assessment to identify patient's overall risk status for chronic LBP and disability.[12] Scores from the SBT allocate patients in low-, medium- or high-risk groups according to patients' prognostic risk for poor outcomes. Several other patient questionnaires have been developed to identify psychological factors associated with LBP. The Tampa Scale of Kinesiophobia (TSK) is used to measure kinesiophobia,[13] and the Four-Dimensional Symptoms Questionnaire (4DSQ) is a questionnaire used to screen for symptoms of distress, depression, anxiety and somatization.[14] LBP practice guidelines recommend healthcare professionals use standardized patient questionnaires for the assessment of patients' prognostic risk,[15] and for the screening of psychological factors.[16] Nevertheless, patient questionnaires are not always implemented in clinical practice.[17]

The literature reveals inconsistent results regarding physiotherapists' ability to estimate patients' prognostic risk and to allocate patients into different risk stratification groups. Bishop et al[18] reported that most physiotherapists recognize intuitively when a patient is at high risk for developing chronicity. Hill et al,[19] however, tested agreement between clinical experts' allocation into risk stratification groups and patient allocation based on scores of the SBT. They found only moderate agreement between the formal screening questionnaire and clinicians' intuition.[19] These 2 studies used clinical vignettes or videos to measure physiotherapists' ability to allocate patients in subgroups,[18,19] but therapists' clinical skills to allocate patients into risk stratification groups has not been previously tested in real clinical practice. Indirect methods such as vignettes may not be adequate to measure physiotherapists' behaviour or their skills in managing LBP.[20] Other pragmatic, observational studies disclosed therapists' difficulty in clinical practice to intuitively assess distress, fear-avoidance beliefs,[21,22] and symptoms of depression.[23] Based on these findings, it is possible that physiotherapists depend on patient questionnaires to allocate patients into risk stratification groups as well as to recognise psychological factors.

Qualitative research has shown that musculoskeletal physiotherapists tend to stigmatize, or feel unprepared to manage, patients with CLBP and dominant psychological factors.[24-26] Therefore, it could be assumed that physiotherapists perceive themselves as less competent managing patients with high psychological distress. In psychotherapy research, it has been shown that therapists' self-reported experience of difficulties in practice have a negative influence on the patient-therapist alliance,[27] with a positive relationship found between alliance and treatment outcomes.[28] It was hypothesized that therapist qualities (e.g. therapist knowledge and skills) may also influence the 'patient-therapist' alliance in physiotherapy practice, as well as treatment outcomes.[29] However, the role of physiotherapists' self-reported competence in managing a patient has not been tested previously in CLBP practice.

The objectives of this study were to: test the agreement between therapists' intuitive allocation of patients into risk stratification groups and patient allocation based on SBT scores, test correlations between physiotherapists' intuitive psychological assessment and scores of patient questionnaires, and explore the influence of patients' psychological factors on physiotherapists' self-reported competence to manage each patient with CLBP.

4.3. Materials and Methods

This study was a pragmatic, observational study approved by the local regional ethics committee (KEK-ZH-Nr: 2014-0533). Patients and therapists signed informed consent prior to study commencement.

Patient Recruitment and Allocation

Patients with LBP were recruited consecutively from a waiting list for musculoskeletal physiotherapy at the Kantonsspital Winterthur, a public hospital in Switzerland. Patient recruitment was based on the clinical information reported on the referral sheet for physiotherapy. Included patients were scheduled randomly to therapists who participated in this study. The first author (E.B.) met recruited patients prior to the intake session to screen for eligibility.

Participants

Patients with CLBP were included for participation. Inclusion criteria were: age between 18 and 65 years, history of LBP for more than 3 months, the primary pain area localized in the lumbar spine (T12 to buttocks), and being able to complete the questionnaires independently in the German language. Exclusion criteria were: pregnancy, rheumatic diseases, progressive neurological diseases,

unstable cardiac or pulmonary conditions, red flag disorders such as cancer, fracture, infection or spinal cord compression/cauda equina syndrome, surgery during the last 3 months or planned surgery. Finally, patients with a diagnosed mental illness (based on DSM-5 criteria[30]) reported on their referral sheet for physiotherapy were excluded, however patients who reported psychological factors remained eligible.

Therapists were graduated physiotherapists or physiotherapy students doing an internship for 3 or 5 months at the hospital. The physiotherapy students were in their fourth or fifth semester of an 8-semester bachelors of science degree program from 2 different universities in Switzerland. There were no exclusion criteria for therapists.

Therapist Instruction Prior to Data Collection

All therapists were introduced to the purpose and background of the study prior to data collection. This 30-minute information session was given according to a self-developed standard operating procedure. Therapists were informed that the study aimed to examine how well physiotherapists recognise psychological factors in patients with LBP. Additionally, the information for therapists included a brief introduction to the fear-avoidance model,[6] and information on the aims and the factor construct of the SBT,[12,31] the 4DSQ,[14] and the TSK.[32,33] All therapists were familiarized with questions of each instrument and received copies of the questionnaires.

Procedure

Patients completed all questionnaires during the meeting prior to the intake session. Management of the patients was at the therapist's discretion, while the scores from the patient questionnaires were not presented to the participating therapists. After the intake session, which often includes assessment and treatment, therapists completed questionnaires for each patient measuring their intuitive risk stratification, assessment of psychological factors, and their own self-reported competence to manage each patient.

Therapist questionnaire

Therapists were asked the following question to allocate patients in prognostic risk groups (translated from German): "How do you estimate the risk that the patient will have persistent functional limitations in one year?" Therapists had to choose 1 of the 3 response categories (1 = low, 2 = medium, or 3 = high). Furthermore, therapists rated on a numeric rating scale (0 = not at all, 10 = very strong) their perceptions regarding patient distress, depression, anxiety and kinesiophobia. Somatization was not evaluated by the therapists. They also had the option to

choose "cannot judge." Finally, for measuring therapists' self-reported competence, therapists were asked to rate their perceived competence to manage the patient (0 = not competent, 10 = very competent).

Patient Questionnaires

A range of questionnaires were administered to patients. The numeric rating scale (0–10) measured average pain intensity over the last week, while the German version of the Roland-Morris Disability Questionnaire (RMDQ) measured back-specific function.[34] The German version of the SBT was chosen to measure the risk of chronicity.[35] The 50-item German Four-Dimensional Symptom Questionnaire (4DSQ) was chosen to measure distress, depression, anxiety and somatization.[14] The 4DSQ has been shown as a valid tool to detect depression and anxiety disorders in general practice patients.[36] Kinesiophobia was measured with the German version of the 17-item Tampa Scale of Kinesiophobia (TSK).[32]

Data Analysis

Risk stratification. Intraclass correlation coefficients, based on a one-way random model [ICC (1.1)], were used to estimate the degree of agreement among therapists' intuitive patient allocation into risk stratification groups and allocation based on SBT scores.

Assessment of psychological factors. Spearman's rho correlation coefficients were calculated to test correlations between therapist perceptions and scores of formal screening questionnaires for distress, depression, anxiety and kinesiophobia. Additionally, Spearman's rho correlation coefficients were used to test associations between patient questionnaires. Correlations were interpreted in line with recommendations (<0.25 = little or no relationship; 0.25 to 0.49 = fair relationship; 0.50 to 0.74 = moderate to good; >0.75 = good to excellent).[37] Correlations between therapist perceptions and patient questionnaires were calculated for the total sample of therapists and separately for therapist subgroups (graduated physiotherapists versus students). Differences between 2 independent correlations were calculated to compare therapist subgroups. Simple Interactive Statistical Analysis (SISA) (www.quantitativeskills.com/sisa/statistics/corrhlp.htm) was used for the comparison of correlations.

Therapists' self-reported competence. A linear mixed model was calculated to estimate the effect of patient-reported distress and kinesiophobia on therapists' self-reported competence to manage the patient, while controlling for the status of the therapist (student or graduated physiotherapist).

$$Y_{ij} = \beta_0 + \beta_1(\text{PT\_status}) + \beta_2(\text{Kinesiophobia}) + \beta_3(\text{Distress}) + u_i + \varepsilon_{ij}$$

Y_{ij} refers to *i*-th observation of therapist's self-reported competence to manage the *j*-it patient. The dependent variable (Y_{ij}) was predicted by a fixed intercept (β_0), as well as therapist's status (β_1), patient score of the TSK (β_2) and patient score of the 4DSQ distress scale (β_3). A random intercept unique to each therapist (u_i), and a residual term (ε_{ij}) were added. The random intercept (u_i) considers the correlation structure of the data due to the repeated measurements of therapists. The restricted maximum likelihood (REML) method was used to estimate the parameters. For the linear mixed model, only patient-reported distress and kinesiophobia were selected as predictor variables, because these variables refer to different psychological constructs, while distress was expected to be correlated with depression and anxiety.[14] Statistical analyses were performed with SPSS (v 24; IBM Analytics, Armonk, New York).

4.4. Results

Characteristics of Participants

Ninety-seven patients with LBP were screened. From this group of patients, 48 refused to participate or were excluded, leaving 49 eligible patients with chronic LBP. Patient characteristics are presented in Table 1. Patients' mean (SD) age was 47.08 (12.51) years. Most patients (38.8%) reported pain lasting between 1 and 3 years. Nine patients (18.4%) were at high risk, 16 (32.6%) were at medium risk, and 24 (49.0%) were at low risk according to the SBT. Moderate correlations were found between the SBT total scores and the TSK scores (r = 0.586), and between the SBT and 4DSQ scales for distress (r = 0.630), depression (r = 0.430) and anxiety (r = 0.498). Only fair correlations were found between the TSK and the 4DSQ scales for distress (r = 0.252), depression (r = 0.325) and anxiety (r = 0.129). Furthermore, there were moderate correlations between the 4DSQ distress and depression scales (r = 0.564) and between the distress and anxiety scales (r = 0.663), with only fair correlations between the 4DSQ depression and anxiety scales (r = 0.425).

Included patients (N = 49) were managed by 20 different therapists. The number of patients seen per therapist varied from 1 to 8. The total sample of therapists included 11 graduated physiotherapists and 9 students. Graduated physiotherapists managed 39 patient and students 10 patients. Physiotherapy and student characteristics are presented in Table 2. There was a significant

difference in age between graduated physiotherapists and students (mean difference = 5.83; t(18)= 3.333, 95%CI = 2.16 to 9.50; p = 0.004).

Table 1. Patient Characteristics (N = 49)[a]

Characteristics	**Value**
Sex (female), n (%)	25 (51.0)
Age, mean (SD)	47.08 (12.51)
Born in Switzerland (yes), n (%)	29 (59.2)
Currently sick listed for LBP (yes), n (%)	12 (24.5)
Duration of the current LBP problem, n (%)	
3 -12 months	17 (34.7)
1 – 3 years	19 (38.8)
> 3 years	13 (26.5)
Pain intensity (NRS, 0-10), mean (SD)	5.14 (2.32)
RMDQ, (scale 0-24), mean (SD)	9.49 (6.82)
SBT total score (scale 0-9), mean (SD)	4.10 (2.30)
SBT subgroups, n (%)	
Low risk	24 (49.0)
Medium risk	16 (32.6)
High risk	9 (18.4)
4DSQ distress scale (scale 0-32), mean (SD)	10.59 (7.98)
4DSQ depression scale (scale 0-12), mean (SD)	1.47 (2.67)
4DSQ anxiety scale (scale 0-24), mean (SD)	2.10 (3.65)
4DSQ somatization scale (scale 0-32), mean (SD)	10.49 (5.65)
TSK (scale 17-68), mean (SD)	34.65 (9.38)

[a] LBP = low back pain; SD = standard deviation; NRS = numeric rating scale; RMDQ = Roland Morris Disability Questionnaire, SBT = STarT Back Screening Tool; TSK = Tampa Scale of Kinesiophobia; 4DSQ = Four-Dimensional Symptom Questionnaire.

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Suggested cut-off score for the 4DSQ distress scale (≥11) for detecting any psychosocial diagnosis for encounter.[14] Suggested cut-off score for the 4DSQ depression scale is ≥3, and ≥8 for the 4DSQ anxiety scale for detecting a moderate anxiety disorder.[36]

Table 2. Physiotherapist and Physiotherapy Student Characteristics (N = 20)

Characteristics	**Physiotherapists**	**Physiotherapy Students[b]**
Sample size, n	11	9
Sex (female), n (%)	7 (63.6%)	7 (77.8%)
Age, mean (SD)	29.27 (4.56)	23.44 (2.83)
Highest education in physiotherapy, n (%)		
College of professional education	3 (27.3%)	N/A
Bachelor of science in Physiotherapy	8 (72.7%)	N/A
Frequency of patients with LBP in their clinic		
At least one patient per day, n (%)	8 (72.7%)	1 (11.1%)
Less than one per day, n (%)	3 (27.3%)	8 (88.9%)
Postgraduate training in LBP management		
Manual therapy, n (%)	7 (63.6%)	N/A
No postgraduate training, n (%)	4 (36.4%)	N/A
Years since graduation, mean (SD)	3.37 (3.47)	N/A
Years of LBP work experience, mean (SD)	2.05 (2.69)	0

LBP = low back pain; N/A = not applicable; [b] students in their fourth or fifth semester of an 8-semester bachelor of science programme in Switzerland.

Table 3: Cross Tabulation of Therapists' Intuitive Patient Allocation into Risk Stratification Groups and Patient Allocation Based on SBT Scores [a]

	SBT allocation			
	low	medium	high	Total
Therapist allocation				
low	9	1	0	10
medium	11	7	5	23
high	4	8	4	16
Total	24	16	9	49

[a] graduated physiotherapists and physiotherapist students; SBT = STarT Back Tool. Cases with perfect agreement = 20 (40.8%).

Risk Stratification

The degree of agreement between therapists' patient allocation and SBT allocation was poor [ICC(1.1): 0.305 (95%CI = 0.030 to 0.537)]. Perfect agreement occurred in 20 out of 49 cases (agreement: 40.8%). Table 3 provides an overview of therapist (graduated physiotherapists and students) patient allocation and allocation based on scores of the SBT. The SBT identified 24 patients (49.0%) as low risk, but therapists allocated only 10 patients (20.4%) to the low-risk subgroup. Interestingly, agreement between therapist allocation and SBT allocation was stronger in the student subgroup (agreement: 70%; ICC = 0.679, 95%CI = 0.160 to 0.908) than for the graduated physiotherapy subgroup (agreement 33.3%; ICC = 0.220, 95%CI = -0.096 to 0.497).

Assessment of Psychological Factors

Correlations between therapists' intuitive psychological assessment and patients' questionnaires for the total group of therapists (graduated physiotherapists and students) are shown in Table 4. Correlations between therapist perceptions and patient psychological status were moderate for distress (r = 0.602), fair for depression (r = 0.304) and anxiety (r = 0.327), while there was no correlation for kinesiophobia (r = -0.007). While the correlations between therapist perceptions and questionnaires did not differ to a statistically significant degree between the 2 therapist subgroups (graduated physiotherapists and students), it is interesting that students' perceptions of depression were more highly correlated with the patient questionnaire (r = 0.717) than graduated physiotherapists' perceptions (r = 0.248). For distress, depression, anxiety and kinesiophobia, therapists had the option to report 'cannot judge' when they felt unable to judge. This option was most often chosen for the domain depression (N = 11), but rarely for other domains.

Table 4: Spearman Rank Correlations Between Therapists'[a] Perception and Formal Screening Questionnaires on the Presence of Distress, Depression, Anxiety, and Kinesiophobia Among Patients With LBP

Domain	Therapist perception	Patient questionnaire	N	r	95%CI
Distress	To what extent do you recognize signs of psychological distress? (NRS, 0 - 10)	4DSQ, distress scale (scale, 0 - 32)	45	.602**	.337 to .784
Depression	To what extent do you recognize signs of depression? (NRS, 0 - 10)	4DSQ, depression scale (scale, 0 - 12)	38	.304	-.067 to .598
Anxiety	To what extent do you recognize signs of anxiety? (NRS, 0 - 10)	4DSQ, anxiety scale (scale, 0 - 24)	47	.327*	.034 to .574
Kinesiophobia	To what extent do you recognize signs of kinesiophobia? (NRS, 0 - 10)	TSK, total score (scale, 17 - 68)	45	-.007	-.301 to .311

[a] Graduated physiotherapists and physiotherapy students. LBP = low back pain; N = number of cases included for analysis (potential exclusions due to rating "cannot judge"); NRS = Numeric Rating Scale (0 = not at all, 10 = very strong); R=Spearman rank correlation coefficient; TSK = Tampa Scale of Kinesiophobia; 4DSQ = Four-Dimensional Symptom Questionnaire; 95% CI = 95% confidence interval, with bootstrap.

[b] $P < .01$ (2-tailed).

[c] $P < .05$ (2-tailed).

Therapists' Self-Reported Competence

Therapists' self-reported competence to manage patients was high (mean±SD = 7.18±2.06). Table 5 shows that patient-reported distress was a significant predictor of therapists' self-reported competence (estimated β = -0.137, SE = 0.031, t = -4.476, 95%CI for β = -0.199 to -0.075), after controlling for the therapist status (student or graduated physiotherapist). This indicates a negative relationship between patient-reported distress and therapist self-reported competence in managing patients with CLBP. Furthermore, therapist's status was identified as a weak positive predictor of competence (estimated β = 1.262, SE = 0.651, t = 1.940, 95%CI for β = -0.072 to 2.597), indicating that graduated physiotherapists rated themselves more competent in the management of their patients than students, but this was not statistically significant.

Table 5. Linear Mixed Model for Therapists' Self-Reported Competence to Manage the Patient With CLBP.[a]

Parameter	**Estimate**	**SE**	***t* value**	**95%CI**
Intercept, β_0	9.301**	.962	9.66	7.361 to 11.241
PT_status (reference: student), β_1	1.262	.651	1.940	-.072 to 2.597
Kinesiophobia, β_2	-.050	.027	-1.890	-.104 to .003
Distress, β_3	-.137**	.031	-4.476	-.199 to -.075
Random effects:				
Between-therapist variance	.416	.504		
Residual variance	2.293	.579		

[a] Graduated physiotherapists and physiotherapy students. Estimate = estimated fixed effects; SE = standard error; CLBP = chronic low back pain; PT_status = student, physiotherapist; 95%CI = 95% confidence interval of estimated effect. [b] $P < .01$.

4.5. Discussion

These results reinforce the hypothesis that physiotherapists and physiotherapy students have difficulty stratifying patients into risk stratification groups and identifying psychological factors without any formal screening questionnaires. Physiotherapists' intuitive allocation into risk stratification groups agreed in only 41% of the cases with the allocation based on the SBT scores. Furthermore, only a moderate correlation was found between therapists' perception of distress and patient reported distress on questionnaires, while correlations between therapists' clinical intuition and questionnaires for other psychological domains were only fair or worse. Finally, patient-reported distress was a negative predictor for therapists' self-reported competence to manage patients with CLBP, highlighting that such patients are deemed a challenge by physiotherapists.

The results from our study on the agreement between therapists' intuitive patient allocation and SBT allocation are in line with previous results.[19] Corresponding to our study, Hill et al[19] found that agreement between clinical experts' patient allocation into risk stratification groups and allocation based on scores of the SBT occurred in only 47% of cases. Hill et al[19] showed video recordings of clinical assessment to clinical experts and asked them to allocate the seen patients into risk stratification groups. Patient videos, similar to clinical vignettes,[20] may not be sufficient to capture the complexity of the psychological assessment in real clinical practice, because therapists are not challenged to actively explore patients' emotions and beliefs. Furthermore, our study showed that therapists were more pessimistic regarding patient risk than the screening instrument. Therapists allocated more patients to the medium-risk or high-risk group than the SBT, as previously seen in the study by Hill et al.[19] Overall, results from our more pragmatic clinical observational study confirm previous results on therapists' intuitive allocation into risk stratification groups.

Our results regarding therapists' intuitive assessment of psychological factors showed that the correlation between therapists' intuitive perception of patient distress and patient-reported distress was moderate, but relationships were weaker in the domains of depression, anxiety and kinesiophobia. These results are mostly consistent with findings from previous studies.[21-23] In the study of Beales et al,[22] the correlation between therapists' perceptions of distress and scores of patient questionnaires was only fair. The relationship found in our study was stronger, but this difference in correlations (0.60 vs. 0.33) may not be meaningful. Furthermore, our results for depression and anxiety are concordant with reported difficulties of physicians and therapists to screen for these symptoms.[23,38] Similar to previous studies,[21,22] no correlation was found between physiotherapists' intuitive perception of kinesiophobia and patient scores on the TSK. Previous studies asked physiotherapists for their perception of patients fear and compared therapists' rating

with patient scores on the Fear-Avoidance Beliefs Questionnaire,[21] or with 1 item of the Örebro Musculoskeletal Pain Screening Questionnaire.[22] The TSK and the Fear-Avoidance Beliefs Questionnaire are based on different constructs, but moderate correlations have been found between the 2 measures.[13] However, despite differences in the specific screening questionnaires used between studies, considerable evidence now exists regarding therapists' difficulty in identifying symptoms of distress, depression, anxiety and kinesiophobia without screening questionnaires.

Intriguingly, students performed somewhat better than graduated physiotherapists at allocating patients into risk stratification groups and were more accurate at identifying symptoms of depression as reported by patients on the questionnaire. None of the differences in correlations between graduated physiotherapists and students in terms of their ability for psychological assessment reached statistical significance. Nevertheless, our preliminary findings are interesting and worth exploring further. This trend towards better results in students is in contrast with Beales et al,[22] who found stronger correlations between therapist's perceptions and patient-reported depression, anxiety and fear in more experienced physiotherapists. In this context, it is possible that the patients themselves, and students, did not recognise or acknowledge psychological factors which were actually present but not captured by patients' questionnaires, whereas graduated physiotherapists were more skilled at identifying these features. The accuracy of patient questionnaires in this study cannot be evaluated. However, 4DSQ scores from our study are marginally higher than those found in another study on patients with sub-acute neck pain in physiotherapy practice,[39] which might be explained by the more persistent pain experienced by patients included in our study.

Differences between graduated physiotherapists and students found in our study may also relate to education. It is possible that present-day students have received more courses on psychology and on psychological factors associated with musculoskeletal pain than former students. Neverthless, it is doubtful that education alone explains the partial superiority of students in our study, because most physiotherapists graduated within the last 5 years with a bachelor of science in physiotherapy, which is the same education level of current students. However, an analysis of the curricula of these education programs was beyond the scope of this study. Another hypothesised explanation may relate to the physiotherapists' clinical behaviour being influenced by their busy work setting. Compared to students, graduated physiotherapists may tend to provide less time and space for patients to express unpleasant emotions and negative thoughts about their pain problem. Research on different groups of therapists may help to better understand how

education, clinical experience, training and different clinical settings influence therapists' behaviour, as well as treatment outcomes.

The analysis on the relationship between patient-reported distress and therapists' self-reported expertise identified patient-reported distress as a significant negative predictor of therapists' self-reported competence to manage the patient. The linear-mixed model estimated that an increase of 1 unit on the distress scale (0-32) resulted in a decrease by 0.137 unit in therapist's self-reported competence (scale, 0-10). Consequently, the model estimates that therapists experience themselves as 40% less competent when managing maximally distressed patients then when managing patients without distress. This relationship is remarkable, since therapists' self-reported ratings can be influenced by a social desirability bias, or the tendency of respondents to answer in a manner that will be viewed favourably by others.[40] This potential bias could have resulted in an over-reporting of 'good behaviour', with an overestimation of their competence. Our results confirm findings from recent qualitative research showing that physiotherapists often feel unprepared to treat patients with dominant psychosocial factors.[25,26,41,42]

Limitations

Study design. It must be acknowledged that the data was measured only at the intake session. The study could not capture how therapists' perceptions evolved over the course of ongoing treatment. This limitation may result in an underestimation of physiotherapists' ability to risk stratify, or assess psychological factors. It could also be premature to measure therapists' self-reported competence after the intake session. Additionally, our study cannot evaluate the prognostic accuracy of therapist intuition or the SBT because of the lack of direct measures of chronicity. Furthermore, we used the SBT as a risk stratification instrument in physiotherapy practice, but it has been noted that the SBT may perform better in general practice than in physiotherapy or chiropractic settings.[43-45]

External validity. This study was conducted at only one specific clinical setting, limiting the generalisability of the findings. Furthermore, patients were excluded when diagnosed mental illnesses were mentioned on their referral sheet for physiotherapy. The decision to exclude these patients was based on our experience that mental illnesses are very often not sufficiently reported on these referral sheets. Therefore, we expected that unreliable reports of mental illness would bias our estimates on therapists' ability to recognize psychological factors. However, this exclusion criteria impacts the generalizability of our results to actual clinical practice where the prevalence of co-morbid mental illness is high in patients with CLBP.

Therapist instructions. The information given to therapists prior to data collection could also have biased their clinical behaviour. We aimed to diminish this potential limitation by providing

only brief general information regarding the objective of the study. No information was given regarding our interest in therapists' self-reported competence. While the information given to therapists prior to data collection could have influenced their assessment of psychological factors, it is unlikely that this biased their self-reported competence.

Study sample. The included therapists managed small, and unequal, numbers of patients. Linear-mixed models handle unequal variances, but comparisons between students and physiotherapists were limited due to the small sample size. Another limitation was the homogeneity among graduated physiotherapists in terms of their age and experience in managing LBP. The sample size of 49 patients was adequate for testing correlations between therapists' perception and screening questionnaires. However, larger sample sizes would justify inclusion of more predictor variables in the linear-mixed model.

Data analysis. Patient-reported depression and anxiety were not included as independent variables in the linear mixed model for therapists' self-reported competence. The selection of distress as a predictor was justified by established moderate correlations between the 4DSQ scales of distress, depression and anxiety. Patients with clinically relevant depression and anxiety disorders are therefore also likely to score high on the distress scale, and relationships found between patient distress and therapist self-reported competence may also exist for depression and anxiety.

Notwithstanding these limitations, strengths of this study include this being the first observational study in a real clinical setting testing physiotherapists' and students' ability to allocate patients into risk stratification groups based on the concept of the SBT. Furthermore, this is the first study providing empirical evidence for negative relationships between patient-reported distress and therapist's self-reported competence in physiotherapy practice for chronic LBP.

Implications

Our findings support the claim that physiotherapists should receive sufficient psychological training to embed psychological perspectives in their clinical practice.[46] High-quality education courses on psychological and psychiatric features might help prepare physiotherapists for their challenges in clinical practice and to improve healthcare services for patients with CLBP, particularly for those patients with high psychological distress. Future research should examine the influence of therapists' self-reported competence in practice on patient-therapist alliance and treatment outcomes.

Conclusion

Physiotherapists were not very accurate at allocating patients into risk stratification groups or identifying psychological factors, especially depression, anxiety and kinesiophobia. Patient-reported distress is a negative predictor of therapist self-reported competence in CLBP practice.

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PART III - Contribution of Therapists' Variables to the Alliance (Study 4)

5. What Contributes to the Patient-Rated Alliance Among Patients Attending Physiotherapy for Chronic Low Back Pain? (Study 4)

Emanuel Brunner[1,2], Wim Dankaerts[3], André Meichtry[4], Kieran O'Sullivan[5,6], Christoph Bauer[4], Susanne Rüttimann[7], Aureliano Crameri[7], Michel Probst[1]

[1] Adapted Physical Activity and Psychomotor Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[2] Institute of Physiotherapy, Kantonsspital Winterthur, Winterthur, Switzerland

[3] Musculoskeletal Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[4] School of Health Professions, Zurich University of Applied Sciences, Winterthur, Switzerland

[5] Sports Spine Centre, Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar

[6] Department of Clinical Therapies, University of Limerick, Limerick, Ireland

[7] School of Applied Psychology, Zurich University of Applied Sciences, Zurich, Switzerland

Key words: therapeutic relationship, prediction, observation, communication, mixed models

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Brunner E, Dankaerts W, Meichtry A, O'Sullivan K, Bauer C, Rüttimann S, Crameri A, Probst M. What contributes to the patient-rated alliance among patients attending physiotherapy for chronic low back pain?

5.1. Abstract

Background. Patient-rated alliance contributes to patient improvements in physiotherapy for chronic low back pain (CLBP). Therapists' contribution to the alliance has never been explored in physiotherapy practice.

Objectives. The objective of this study was to explore associations between alliance, physiotherapists' self-reported competence and satisfaction to manage the patient, and patient-reported distress, and investigate associations between patients' communication of negative emotions during the intake session and patient-rated alliance.

Design. Naturalistic, cohort study.

Methods. Intake sessions (N = 16) were video- and audio-recorded. After these intake sessions, physiotherapists' self-reported their competence and satisfaction to manage the patient with CLBP. Patient-rated alliance was measured after the third physiotherapy session. Pearson correlation coefficients were calculated for testing relationships between alliance, physiotherapists' self-reported competence and satisfaction, and patient distress. A linear mixed model was used to further examine associations between alliance, physiotherapists' self-reported variables, and distress. The Verona Coding Definitions of Emotional Sequences (VR-CoDES) were used to identify patients' communication of negative emotions. Two independent raters conducted the communication analysis with the VR-CoDES.

Results. Patient-rated alliance was positively related ($r = 0.76$, $p = 0.001$) with physiotherapists' self-reported satisfaction to manage the patient. The linear mixed model on patient-rated alliance estimated that physiotherapists' self-reported variables have positive effects on alliance, and that these effects were strongest in patients reporting high levels of distress at treatment baseline. The analysis of the association between patients' communication of negative emotions and patient-rated alliance was inconclusive.

Conclusion. Physiotherapists' self-reported competence and satisfaction to manage the patient may contribute to the development of the alliance in CLBP practice.

5.2. Introduction

'Patient-therapist' alliance is considered an important attribute of effective treatments in psychotherapy.[1-4] This alliance is one of several factors included in the psychiatric common factors mdel, but the most extensively investigate common factor.[3,5,6] The common factors model posits that psychotherapy outcomes are not only determined by the specific therapeutic techniques used, and that a large proportion of the variance in outcomes is explained by other factors including common factors and expectancies.[1,4] A meta-analysis based on 190 psychotherapy studies found a significant and robust relationship (r = 0.28; 95%CI = 0.25 to 0.30) between the alliance and treatment outcomes.[7] It was shown that the therapist contributes significantly to the alliance in psychotherapy,[8,9] though even more than the patient.[10]

The alliance between therapist and patient may also be relevant in physiotherapy for many patients, including those with chronic low back pain (CLBP).[11] Preliminary studies indeed found significant relationships between patient-rated alliance measured in early treatment and treatment outcomes in CLBP.[12-14] Ferreira et al.[12] identified alliance as predictor of disability reduction (coefficient = -0.11). However, research on alliance in physiotherapy remains limited, and it has never been explored how the alliance evolves in physiotherapy practice, and how therapist and patient variables contribute to the patient-rated alliance.

Therapist variables that may influence the patient-therapist alliance in CLBP practice have been reported previously. Qualitative research disclosed that physiotherapists often feel unprepared to manage CLBP associated with psychological factors.[15,16] Furthermore, some physiotherapists may even stigmatize patients experiencing psychological problems.[16,17] It is likely that negative experiences in therapy hinder physiotherapists ability to foster strong alliances with their patients. Furthermore, patient variables have been reported to influence the CLBP management. Indeed, patient-reported distress at treatment baseline was identified as negative predictor of physiotherapists' self-reported ability in managing the patient.[18] In addition, the expression of negative emotions by the patient might influence the CLBP management, through the potential lack of physiotherapists' confidence in their ability to patients with psychological factors. Therefore, we assumed that lower alliance ratings would be observed in patients who disclose negative emotions towards the therapist than in patients who do not express negative emotions in therapy.

The primary objective of this study was to explore associations between patient-rated alliance, physiotherapists' self-reported competence and their satisfaction to manage the patient with CLBP, and patient-reported distress at baseline. The secondary objective was to investigate associations between patients' communication of negative emotions during the intake session and the patient-rated alliance measured after the third session. Physiotherapists may have difficulties dealing with psychological factors when treating patients with CLBP.[15,16] The potential lack of therapists' confidence in their ability to help patients with negative mood may have a negative influence on the alliance.

5.3. Materials and Methods

This was a naturalistic observational study conducted in outpatient physiotherapy practice. The study was approved by the local regional ethics committee (KEK-ZH-Nr. 2013-0489).

Patient Recruitment and Allocation

Patients with low back pain problems were recruited consecutively from a waiting list for musculoskeletal physiotherapy in a public hospital in Switzerland. Patient recruitment was based on the clinical information reported on the referral sheet for physiotherapy. The first author (E.B.) met patients prior to the intake session to screen for eligibility. Recruited patients were assigned to therapists (N=8) based on availability.

Participants

To be eligible for inclusion, patients had to be between 18 and 65 years old and report a history of CLBP for more than three months. The primary pain area needed to be localized in the lumbar region (T12 to buttocks) and patients needed to be able to understand German to complete the questionnaires independently. Exclusion criteria were: pregnancy, rheumatic diseases, progressive neurological diseases, unstable cardiac or pulmonary conditions, red flag disorders such as cancer, fracture, infection or spinal cord compression/cauda equina syndrome, and when patients underwent surgery during the last three months or when surgery was planned.

Participating therapists were either graduated physiotherapists (N = 5) or physiotherapy students (N = 3) doing an internship for three or five months at the hospital. The physiotherapy students were in their fourth or fifth semester of an eight semester Bachelor of Science programme from two different universities in Switzerland. There were no other exclusion criteria for therapists.

Information Provided to Therapists Regarding the Study

Therapists were informed that the study aimed to explore associations between therapeutic communication and alliance. They were informed about the observation during the intake session and analysis of their clinical behaviour. No further information on the study objectives and methodologies was communication.

Procedure

Figure 1 illustrates the procedure of this study. Patients completed all questionnaires prior to the intake session. Management of the patients was at the therapist's discretion. Patient scores on the baseline questionnaires were not presented to the physiotherapist, but were, on request of the therapist, available prior to the second session. The intake session was video- and audio-recorded. After this intake session, which often included both assessment and treatment, therapists completed questions on their own self-reported competence and their self-reported satisfaction to manage each patient. Patient-rated alliance was measured after the third physiotherapy session.

Patient Questionnaires

The numeric rating scale (NRS, 0-10) measured average pain intensity over the last week, while the German version of the Roland Morris Disability Questionnaire (RMDQ; scale, 0-24) measured back-specific function.[19] The 50-item German Four-Dimensional Symptom Questionnaire (4DSQ) was chosen to measure psychological distress, depression, anxiety, and somatization.[20] The 4DSQ distress scale measures psychological distress (distress scale, 0-32). In the development of the 4DSQ, psychological distress was conceptualized as the direct manifestation of the effort people must exert to maintain their psychosocial homeostasis and social functioning when confronted with taxing life stress.[20,21] Higher scores on 4DSQ scales represent higher symptom severity. The recommended cut-off point for 'detecting' any psychosocial diagnosis in an encounter using this scale is ≥11.[20] The 4DSQ depression scale (0-12) and the anxiety scale (0-24) refer to the very core of these mental disorders.[20] The recommended cut-off point for detecting a moderate depressive disorder is ≥3, and the recommended cut-off point for detecting a moderate anxiety disorder is ≥8.[22]

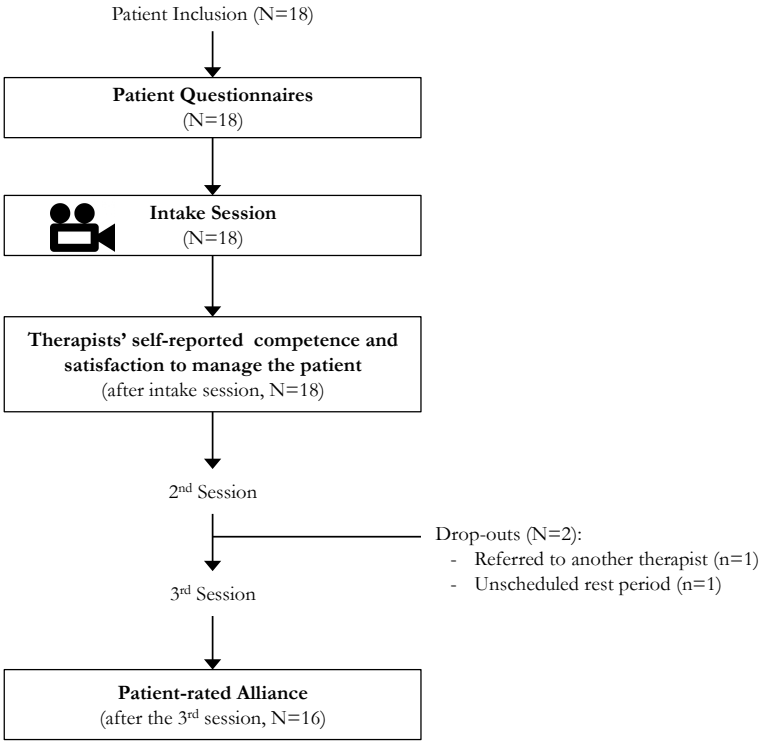


Figure 1**:** Flow Diagram Illustrating the Study Procedure.

Observation of the Intake Session

Intake sessions were recorded with two portable cameras fixed in opposite corners and a microphone attached to the celling of the therapy room. The cameras were one Sony HDR-MV1 video recorder and one GoPro Hero 4. The RØDE smartLav+ microphone was connected to the Sony HDR-MV1 recorder. Patients and physiotherapists were made aware of the video/audio recording.

Therapists' Self-Reported Variables

After the intake session, physiotherapists rated on numeric rating scales their self-reported competence (0 = not competent, 10 = very competent) and satisfaction (0 = not at all, 10 very much) to manage the patient.

Alliance

Patient-rated alliance was measured with the German version of the Working Alliance Inventory – short revised (WAI-SR).[23] The Working Alliance Inventory is a core measure of alliance in psychotherapy research.[7] The WAI-SR is a 12-item scale and measures the three aspects of alliance proposed by Bordin;[24] (i) agreement on the task of therapy, (ii) agreement on the goals of therapy and (iii) development of an affective bond between both patient and therapist.[25] Scores on the WAI-SR range from 12 to 60, with higher scores representing a stronger alliance.

Patients' Communication of Negative Emotions

Recorded intake sessions were transcribed verbatim by the first author. Transcripts were analysed with the Verona Coding Definitions of Emotional Sequences (VR-CoDES).[26] This method was used to code patients' expressions of negative emotions and therapists' responses to these psychological disclosures. Detailed descriptions of this coding system can be found elsewhere.[26] In short, the VR-CoDES initially categorizes patient expression of negative emotions as 'cues' or 'concerns', and codes therapist responses to patient expressions. *Cues* are defined as verbal or nonverbal hints, which suggest an underlying negative emotion. *Concerns* are defined as clear and unambiguous expressions of any conscious experience related to depressive or anxious mood.[26]

Anonymized transcripts of the intake sessions were coded by two co-authors (C.B. and S.R.). One rater was a 35 year old female psychologist with a Bachelor of Science in Psychology who was in her first year of a two-years masters degree program. The other rater as a 37 year old qualified male physiotherapist with a Master of Science in Physiotherapy who was a doctoral student. Prior to the coding, both raters received one day of training from the first author and afterwards rated all transcripts independently. Disagreement was resolved after completion of all ratings and in discussion with the first author.

Comparison Patient Questionnaires and Patients' Communication of Negative Emotions

Patients' scores on the 4DSQ depression and anxiety scales were compared with patients' communication of depressive and anxious emotions (or concerns) during the intake session. Therefore, patients were allocated in four different subgroups based on two criteria: *reporting* of anxious and/or depressive emotions on the 4DSQ depression and anxiety scales (reported, not reported), and *disclosure* of these emotions during the intake session (disclosed, not disclosed). To be classified as 'reported' patients had to scored positively (score ≥1) on the 4DSQ depression and/or anxiety scales. To be classified as 'disclosed' patients had to communicate one or more concerns during the intake session.

Data Analysis

Firstly, Pearson correlation coefficients were calculated for testing relationships between patient-rated alliance, physiotherapist self-reported variables and patient variables (distress, depression and anxiety), and patient-reported distress at treatment baseline. In a second step, we pilot-tested a linear mixed model on patient-rated alliance to estimate effects of physiotherapists' self-reported variables (competence and satisfaction) on the alliance, and estimate whether these effects were different for different levels of patient-reported distress at baseline. The model included eight parameters. These parameters included three main effects: competence, satisfaction and patient distress, and two interaction effects (competence*distress, satisfaction*distress). These interactions estimated whether the effects of physiotherapists' self-reported variables on the patient-rated alliance were moderated by patient-reported distress. Additionally, the linear mixed model included a random intercept unique to each therapist and a residual term. The random intercept considers the correlation structure of the data due to the repeated measurements of therapists. The residual term represents the difference between the observed values and the estimated (predicted) values. The distribution of residuals, or the assumption of constant variance in the linear mixed model was examined by plotting predicted values against residuals. For testing the reliability of the VR-CoDES, Cohen's Kappa was calculated for testing the inter-rater agreement between the two independent raters. Inter-rater agreement was tested on all transcripts. Statistical analyses were performed with SPSS (Version 24). Figures for illustrating the interaction effects were created with R.[27]

5.4. Results

Eighteen patients with CLBP were included in this study, but only 16 patients completed the alliance measure after the third physiotherapy session. The characteristics of these 16 patients are presented in Table 1. Patient levels of depression (mean±SD = 0.04±0.81) and anxiety (mean±SD = 1.31±2.80) were low, and were considerably lower than the aforementioned cut-off points for detecting moderate depression and anxiety disorders (depression = ≥3, anxiety = ≥8).[22] The level of patient-reported distress was higher (mean±SD = 8.06±6.84), but also below the recommended cut-off point of ≥11 for detecting any psychosocial diagnosis.[20]

The 16 patients were treated by eight different therapists; five graduated physiotherapists and three physiotherapy students. The number of patients seen per therapist varied between one and three. The mean(SD) age of graduated physiotherapists was 29.00(1.87) years, and their mean working experience with LBP patients was 4.80(1.92) years. For the graduated physiotherapists (N

= 5), three graduated from a college of professional education and two graduated with a Bachelor of Science in Physiotherapy. In terms of post-graduate training, four graduated physiotherapists underwent training in manual therapy and one had no specific post-graduate training in LBP management. All physiotherapy students were female and their mean(SD) age was 22.00(2.00) years.

Table 1: Patient Characteristics (N = 16)

Characteristics	**N (%)**	**Mean (SD)**
Sex (female)	8 (50.0)	
Age		46.56 (12.43)
Currently sick listed for LBP (yes)	2 (12.5)	
Duration of the current LBP problem		
3 -12 months	9 (56.3)	
1 – 3 years	3 (18.7)	
> 3 years	4 (25.00)	
Pain intensity (range 0-10)		5.38 (2.25)
RMDQ (range 0-24)		7.19 (6.27)
Distress (4DSQ distress scale, 0-32)		8.06 (6.84)
Somatization (4DSQ somatization scale, 0-32)		8.56 (5.38)
Depression (4DSQ depression scale, 0-12)		0.44 (0.81)
Anxiety (4DSQ anxiety scale, 0-24)		1.31 (2.80)

N = number of patients; SD = standard deviation; LBP = low back pain; RMDQ = Roland Morris Disability Questionnaire; 4DSQ = Four-Dimensional Symptoms Questionnaire.

Associations Between Alliance, Physiotherapists' Self-Reported Variables, and Patient-Reported Distress

Patient-rated alliance (mean±SD = 50.25±1.91), and physiotherapists' self-reported competence (mean±SD = 7.88±1.63) and physiotherapists' self-reported satisfaction (mean±SD = 8.31±2.50) to manage the patient were both high. A positive and strong relationship (r = 0.76, *p* = 0.001) was found between physiotherapists' self-reported satisfaction to manage the patient with CLBP and patient-rated alliance. The correlation between alliance and patient-reported distress at treatment baseline was negative and only moderate (r = -0.48. *p* = 0.06). Table 2 presents correlation coefficients between these variables.

Table 2: Means, Standard Deviations (SD), and Pearson Correlation Coefficients Among Patient-Rated Alliance, Therapists' Self-Reported Variables (Competence and Satisfaction) and Patient-Reported Distress (N=16)

Variables	**Mean (SD)**	**Alliance**	**Competence**	**Satisfaction**	**Distress**
Alliance (scale, 12-60)	50.25 (7.65)	-	.25	.76**	.48
Competence (scale, 0-10)	7.88 (2.50)	-	-	.49	.71**
Satisfaction (scale, 0-10)	8.31 (2.35)	-	-	-	.42
Distress (scale, 0-32)	8.06 (6.84)	-	-	-	-

Alliance = patient-rated alliance measured after the third physiotherapy session with the Working Alliance Inventory – short revised (WAI-SR); Competence = therapists' self-reported competence to manage the patient; Satisfaction = therapists' self-reported satisfaction to manage the patient; Distress, Depression and Anxiety measured with the Four-Dimensional Symptoms Questionnaire.

***p* value < .01.

Table 3 shows results from the linear mixed model on patient-rated alliance. Plotted residuals of the linear mixed model showed acceptable constant variability of residuals along predicted values, indicating that the assumption of constant variance was met. The model estimated two positive interaction effects (competence*distress and satisfaction*distress) on patient-rated alliance. These interactions indicate that the positive effects of therapists' self-reported variables (competence and satisfaction) on patient-rated alliance might be strongest in patients reporting high levels of psychological distress at treatment baseline.

Table 3: Results from the Linear Mixed Model on Patient-Rated Alliance Measured After the Third Physiotherapy Session (N=16)

Parameter	**Estimate**	**SE**	***t* value**	**95%CI**
Intercept, β_0	74.78**	7.19	10.40	56.84 to 92.73
Competence, β_1	-1.83*	.63	-2.92	-3.48 to -.17
Satisfaction, β_2	-.93	.60	-1.54	-2.54 to .69
Distress, β_3	-2.59*	.44	-5.94	-3.69 to -1.49
Competence * Distress, β_4	.14*	.05	3.10	.02 to .26
Satisfaction * Distress, β_5	.18**	.04	4.77	.08 to .28
Random effects:				
Between-therapist variance	15.07	8.75		
Residual variance	1.17	.90		

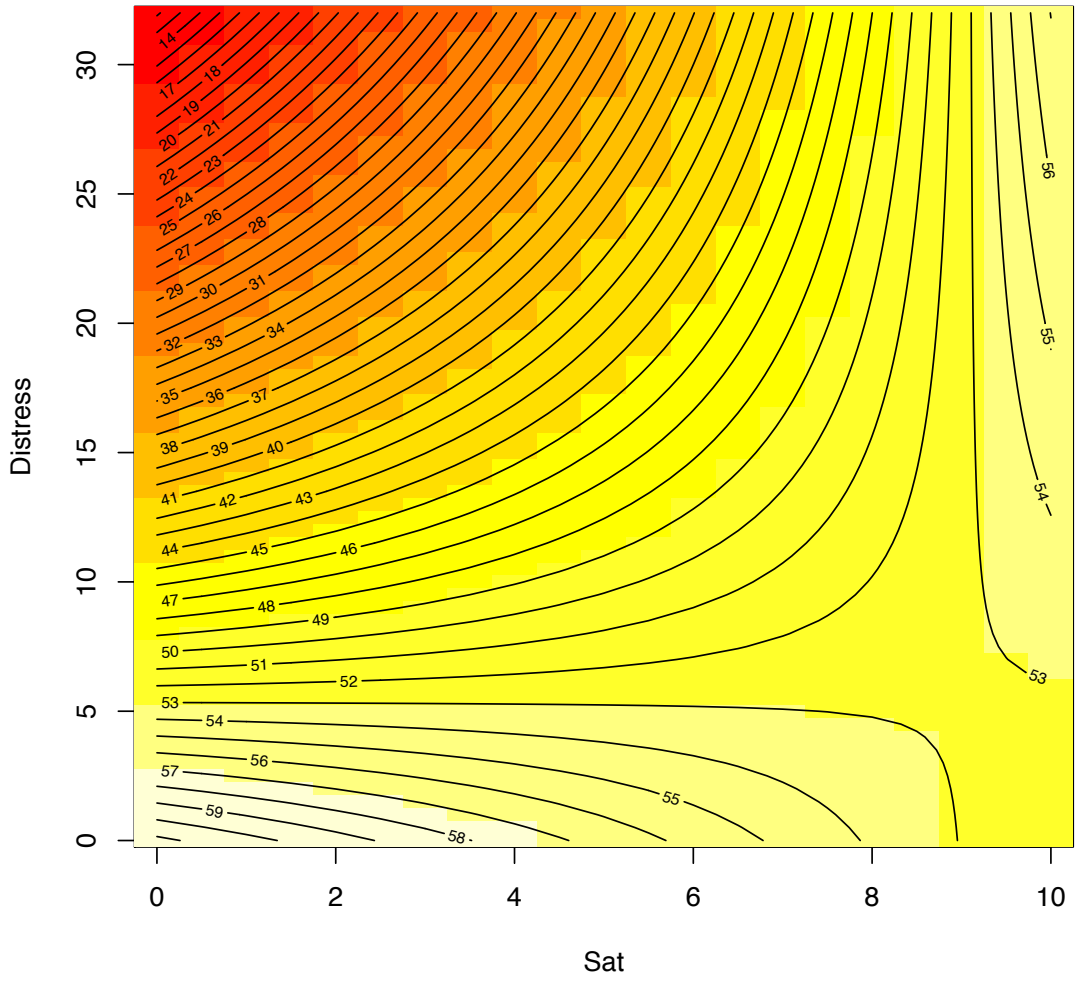
Estimate = estimated effect (unstandardized coefficients); SE = standard error; 95%CI = 95% Confidence Interval.

*p value < .05; **p value < .01.

Statistical model: $Y_{ij} = \beta_0 + \beta_1(\text{Competence}_j) + \beta_2(\text{Satisfaction}_j) + \beta_3(\text{Distress}_i) + \beta_4(\text{Competence}_i * \text{Distress}_j) + \beta_5(\text{Satisfaction}_i * \text{Distress}_j) + u_i + \varepsilon_{ij}$

Figure 2 illustrates the estimated interaction effect (satisfaction*distress) that was estimated in the linear mixed model on patient-rated alliance. This figure shows that predicted alliance values were lower in patients reporting higher levels of psychological distress then in patients with lower distress. Furthermore, the plotted regression lines indicate that the positive effect of physiotherapists' self-reported satisfaction on alliance was strongest in patients reporting high levels of psychological distress at treatment baseline.

Figure 2: Illustrations of the Interaction Effect (satisfaction*distress) from the Linear Mixed Model on Patient-Rated Alliance After the Third Session (N=16)



Values indicate population-level predictions of patient-rated alliance (scale, 12-60), when competence is fixed at the mean value = 7.88. Dark red colors indicate lower alliance and light yellow colors indicate higher alliance values.

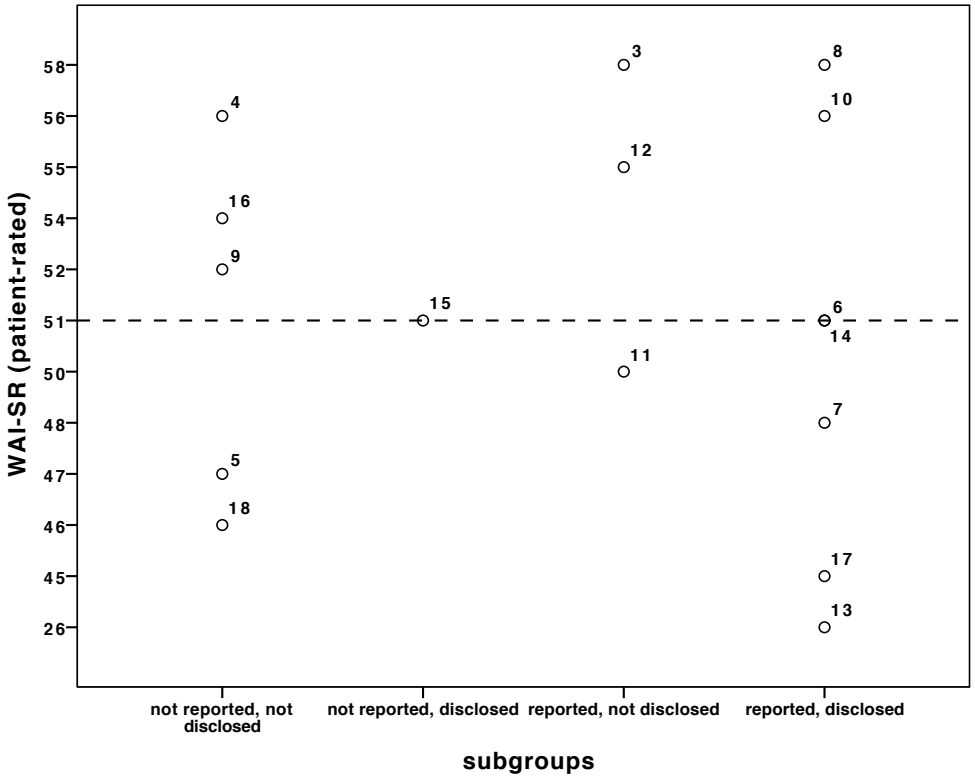
Sat = physiotherapists' self-reported satisfaction to mange the patient (scale, 0-10), measured after the intake session; Distress = Four-Dimensional Symptoms Questionnaires, distress scale (0-32), measured at treatment baseline.

Association Between Patients' Communication of Negative Emotions and Alliance

The communication analysis showed that the mean duration of the 16 intake sessions was 27:29 minutes (range = 19:14 to 32:39). Tests on the inter-rater agreement disclosed poor agreement regarding cues (Kappa = 0.12). The psychologist identified 186 cues and the physiotherapist only 93 cues. In terms of concerns, the inter-rater agreement was good (Kappa = 0.71). Perfect agreement on the coding of patient concerns was found in 13 out of 16 analysed intake sessions (81.3%).

One patient did not report anxious and/or depressive emotions on the 4DSQ but communicated such negative emotions explicitly during the intake session. Most patients (N = 8) reported depressive and/or anxious emotions on the questionnaire and disclosed these concerns also in therapy. Figure 3 displays patient-rated alliance values against disclosures of depressive or anxious emotions during the intake session. Most of the alliance ratings from the lower half of the data sample were found in the subgroup 'reported, disclosed'. However, this figure is not conclusive. Further analyses on the association between patient communication of negative emotions and alliance were omitted.

Figure 3: Dot Plot of Patient-Rated Alliance Values (N = 16) With Patient Allocation to Subgroups Based on Patient's Self-Reported Depressive and/or Anxious Emotions on the 4DSQ and Patient's Communication of Concerns During the Intake Session



WAI-SR = Working Alliance Inventory-Short Revised. Dots refer to observed WAI-SR scores (scale, 12-60). Data labels indicate case numbers. Dotted line refers to the median of patient alliance rating (median=51.0). The median is presented for separating the higher from the lower half of the data sample.

5.5. Discussion

The primary objective of this study was to explore associations between alliance, physiotherapists' self-reported variables (competence and satisfaction), and patient-reported distress. This study represents the first investigation of therapists' contribution to the alliance in physiotherapy practice. We found that physiotherapists' perception of their own competence and satisfaction in managing the patient with CLBP was positively related with patient-rated alliance. Furthermore, our data showed that it is likely that these positive effects on alliance are strongest in patients reporting high levels of psychological distress at treatment baseline.

Associations Between Alliance, Physiotherapists' Self-Reported Variables, and Patient Distress

Our results showed that physiotherapists' reports of their experiences in therapy were related with the development of the alliance in later treatment. Similar effects of therapists' self-reported variables on patient-rated alliance were found in psychotherapy research.[9] Nissen-Lie et al.[9] found a negative effect of therapists' self-reported experience of difficulties in practice on patient-rated alliance. In their study, psychotherapists' experience of difficulties was measured with items from the Development of Psychotherapists Common Core Questionnaire (DPCCQ).[28] High scores on this scale represented more experienced hostility and empathic deficiencies toward patients, and more negative experiences in practice related to weaker patient-rated alliances in psychotherapies. Our results indicate similarities between psychotherapy and physiotherapy for patients with CLBP and high psychological distress. The linear mixed model on patient-rated alliance yielded positive interaction effects, indicating that the contribution of physiotherapists' perception of their competence and satisfaction to manage the patient to the alliance depends on the level of patients' psychological distress at baseline. Based on these findings, it could be hypothesized that the influence of 'common' factors in physiotherapy practice depends on the level of psychological disturbances among patients. Additional research is needed to further explore these potential associations.

Association Between Patients' Communication of Negative Emotions and Alliance

In the communication analysis with the VR-CoDES, agreement between the two independent raters in identifying concerns was good and comparable with results from a similar study.[29] In contrast, agreement on cues was insufficient in our study (Kappe = 0.12) and significantly lower than in the previous study from Eide et al.[29] In their study, the inter-rater agreement for cues was much higher (Kappa = 0.60 v 0.12).[29] This greater disagreement found in our study may relate to the use of independently trained raters without previous knowledge or experience in the use of the

VR-CoDES. The raters who applied the VR-CoDES in previous studies may have been more experienced in communication analysis than the raters in our study.[29-32] To our knowledge, this was the first study showing negative results regarding inter-rater agreement in the VR-CoDES. Our results should not question the reliability of the VR-CoDES, but suggest that the use of this research method may require extensive training.

The VR-CoDES showed that not every patient who reported depressive and anxious emotions on the patient questionnaire expressed these emotions explicitly during the intake session. On the other hand, our results may indicate that it is likely that some patients do not respond to psychological screening questionnaires, but express these psychological factors in therapy. These findings support the recommendation that physiotherapists should use patient questionnaires and their communication skills for the assessment of psychological factors.[33,34]

We assumed that lower alliance ratings would be observed in patients who communicate their negative emotions towards the therapist than in patients who do not express negative emotions in therapy. Unfortunately, due to the small group of patients (N = 3) allocated to the 'reported, not disclosed' subgroup this assumption could not be tested further. Furthermore, it is not unlikely that patients who do not express concerns may verbalize their emotions more often in the form of hints (or cues) to unpleasant emotions. These aspects of patients' communication of negative emotions could not be analysed in detail in this study because of the low inter-rater agreement on cues. Despite our inconclusive results from the communication analysis, our findings might be informative for future research.

Limitations

The key limitation is the small sample size. A larger number of observations may have resulted in more precision of estimated effects, and in more confidence regarding estimated coefficients from the linear mixed model. The small sample size also limited our ability to include more parameters into the linear mixed model. Future research should consider the inclusion of other patient and therapist variables (e.g. interpersonal skills, personality, and communication style). Another limitation is that the validity of the alliance measure (WAI-SR) has never been examined in physiotherapy settings.[35] Furthermore, a limitation is the insufficient inter-rater agreement on the VR-CoDES for the identification of cues. The fact that this project was a single centre study limits the generalisability of our results. Additionally, participating therapists had personal contact with the first author, because they work clinically at the same institution. The rather close contact with the observer before, and during, data collection could influence therapists' behaviour and their self-reported variables. However, we aimed to reduce the effect of the observer by blinding therapists

to the specific study objectives and the methodology of the communication analysis. Another limitation of this study is the inclusion of physiotherapists and students, and the homogeneity within the group of graduated physiotherapists. This group represented a relatively young group of therapists without specific specialisation in psychology-informed interventions. It might be relevant for future research to include different groups of physiotherapists, e.g. diverse in terms of their education, specialisations and work experience. Finally, therapists' self-reported variables and patient-rated alliance were only measured at one point in time. These single-point measurements could not capture how therapists' self-reported variables and the alliance changed in later treatment sessions. Despite these limitations, this is the first study exploring the associations between alliance, therapist variables, and patient variables.

Conclusions

It is likely that physiotherapists' perceptions of their own competence and satisfaction in managing patients have positive effects on patient-rated alliance in CLBP practice. Furthermore, the effects of therapists' variables on alliance might be strongest in patients reporting high levels of psychological distress at baseline. Future research is needed to explore how physiotherapists foster strong alliances in clinical practice. Additionally, it might be relevant to test whether physiotherapists can be trained in their abilities to foster strong alliances with their patients.

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General Discussion

6. General Discussion

6.1. Introduction

CLBP remains a major health problem in western societies. Research in recent decades has indicated that patients with CLBP and psychological problems should receive special attention.[1] In these patients, the effects of therapies on treatment outcomes are often determined by changes in psychological factors such as catastrophizing, fear of pain or self-efficacy.[2] Over the years, it has been suggested that psychological perspectives should be embedded in musculoskeletal physiotherapy practice.[3] However, most physiotherapists seem to struggle with incorporating such approaches into the management of CLBP patients with psychological distress.[4-6] The potential discrepancy between patients' needs for psychological support and physiotherapists' readiness to address these psychological factors may result in frustration for both physiotherapists and patients.[4]

The common factors perspective from psychotherapy postulates that there are different pathways through which psychotherapy produces benefits to patients, including common factors, expectations and specific therapeutic techniques.[7] Common factors are factors (including the patient-therapist alliance) that are common in all forms of therapy and that are necessary and sufficient for changes in patient symptoms.[8-10] In psychotherapy, the discussion of common factors was initiated as early as 1936, with the publication of a seminal review by Saul Rosenzweig.[11] Since then, there has been lively and controversial debate concerning the common factors perspective,[12] which is now based on a substantial body of research.[13,14]

In this doctoral thesis, four studies were outlined focusing on measuring common factors and exploring physiotherapists' contributions to the patient-therapist alliance in CLBP practice. This research is novel since the investigation of common factors in physiotherapy is in its infancy. Indeed, few studies have examined the relationship between the patient-rated alliance and treatment outcomes. These studies demonstrated evidence for this alliance-outcome relationship.[15-17] This doctoral research aimed to integrate some perspectives from psychotherapy into physiotherapy practice for CLBP, and focused on the measurement of factors that might be related to the alliance in physiotherapy practice.

The studies conducted in this doctoral research represent an early step towards increasing our knowledge about common factors in physiotherapy. Despite their limitations, these studies may help to broaden our knowledge regarding the skills and attributes needed by physiotherapists to manage these 'complex' patients with high psychological distress.

This **General Discussion** is the final chapter of this doctoral thesis. This chapter provides a summary of the main findings from the four studies and highlights methodological considerations for future research on common factors in physiotherapy. The implications arising from these studies are presented. Finally, limitations of this research are outlined, and recommendations for future research are proposed.

6.2. Main Findings

This section summarizes the main findings of the four studies in this doctoral research.

Part I - *Validation of Research Methods*

Previous studies have demonstrated that physiotherapists with strong biomedical beliefs (e.g., pain is the direct consequence of tissue pathology)[18] are more likely to advise patients to avoid pain-related activities and work until the pain disappears.[19-21] While this line of research may have the potential to examine how therapist variables influence patients' psychological barriers to recovery and the patient-therapist interactions, the validity of the research methods that are frequently used has been questioned[22,23]. The findings from Study 1 and Study 2 supported these methodological concerns. The factor analysis using the German version of the PABS-PT (Study 1) showed that this measurement scale should be revised. Indeed, the hypothesized 2-factor model may not be an appropriate representation of the PABS-PT data. The main concerns regarding the German PABS-PT were related to biopsychosocial factors or subscales, indicating that caution is needed when using the German version of the PABS-PT to estimate to what extent physiotherapists consider psychological and social factors as important contributors to pain experiences in patients with LBP.

The validation study comparing clinical vignettes with standardized patients (Study 2) showed that physiotherapists' self-reported behaviours on clinical vignettes demonstrate only poor concordance with their behaviour measured by standardized patients in real clinical practice. These results support the hypothesis that clinical vignettes measure physiotherapists' knowledge about LBP management rather than their actual behaviour in clinical practice.[24,25] Intriguingly, physiotherapists detected 50% of the standardized patients. The high rate of detected actors reflects the challenge of using standardized patients in physiotherapy practice. In contrast, the study also disclosed that physiotherapists are often not able to recognize whether the patient presents as a 'real' patient or acts his/her pain experience. This finding raised questions regarding physiotherapists' clinical reasoning skills or their ability to identify psychological factors. Based on the data presented in **Part I**, we decided not to use the PABS-PT and clinical vignettes in later

studies. Study 3 and Study 4 focused on therapists' abilities to identify and address psychological factors in real clinical practice. Furthermore, it was deemed essential to use direct observations of patient-therapist interactions in physiotherapy practice.

Part II - *Physiotherapists' Ability to Identify and Address Psychological Factors*

Different patient questionnaires have been developed to screen for psychological factors associated with LBP. Clinical practice guidelines recommend healthcare professionals use questionnaires for the assessment of psychological factors and patients' prognostic risks.[26,27] Our results presented in **Part II** showed that physiotherapists were not very accurate in allocating patients into risk stratification groups (low, medium or high) or identifying psychological factors, especially depression, anxiety and kinesiophobia. These findings were consistent with the results of previous studies examining the ability of clinical experts to allocate patients into risk stratification groups[28] and a therapist's ability to assess psychological factors without patient questionnaires.[29,30] The analysis of predictors of physiotherapists' self-reported competence to manage patients (Study 3) was the first quantitative research to address the relationship between patient variables and physiotherapists' self-reported experiences in therapy. We identified patient-reported psychological distress at treatment baseline as a significant negative predictor of therapists' self-reported competence to manage CLBP measured after intake sessions. Our empirical findings are consistent with results from previous qualitative research showing that physiotherapists often feel unprepared to address psychological factors.[4,5,31] Overall, our findings from the research outlined in **Part II** support the hypothesis that physiotherapists often lack the competence to address psychological factors in clinical practice.

Part III - *Contribution of Therapist and Patient Variables to the Alliance*

In **Part III**, we explored associations between physiotherapists' self-reported experiences in therapy (competence and satisfaction to manage the patient) and the patient-rated alliance. We also explored whether these associations were moderated by patient-reported distress at baseline. Our results indicate that physiotherapists' self-reported competence and satisfaction in managing patients may have a positive effect on the patient-rated alliance, and these effects might be strongest in patients with high psychological distress. The analysis of the relationship between therapist variables and the patient-rated alliance (Study 4) represents the first explorative investigation of factors associated with the development of the alliance in physiotherapy practice. Our results are consistent with findings from a similar study in psychotherapy showing that therapists' self-reported experiences of difficulties during therapy predicted patient-rated alliances measured early

at the start of the treatment.[32] In Study 4, we also used video and audio recordings of intake sessions to examine associations between patients' communications of negative emotions during the intake session and the patient-rated alliance. This analysis was motivated by the assumption that therapists may experience more difficulties in developing alliances when patients disclose psychological factors in therapy. The results from the communication analysis were inconclusive and not sufficient for further discussions regarding the influence of patient and therapist communication behaviours in the alliance. Despite these inconclusive results, we decided to present the data in this doctoral thesis. The findings from this study might be informative for future research investigating the influence of patients' and therapists' behaviours on alliances in physiotherapy.

6.3. Methodological Considerations for Future Research on Common Factors in Physiotherapy

This section relates findings from our studies with the psychotherapeutic common factors perspective, and it highlights methodological considerations for future research on common factors in physiotherapy. The psychotherapeutic common factors perspective describes factors necessary and sufficient for patient improvements in therapy that are present in all forms of successful psychotherapy.[8-10] Briefly, these common factors include: (i) a confident relationship with a therapist, (ii) a therapist who the patient believes has the power, expertise, or ability to help, (iii) a rational or conceptual scheme that explains the patient's symptoms, and (iv) a ritual or procedure that is consistent with this conceptual scheme.[8-10] The studies in this doctoral research were designed to measure aspects of some common factors that might be relevant in physiotherapy and to explore associations between common factors.

Therapist and Patient Conceptual Schema Explaining Patient Symptoms

Physiotherapists' attitudes and beliefs towards LBP management, as measured with the PABS-PT, can also be described as therapists' rational or conceptual schemes that explain the patient's symptoms. Based on the psychotherapeutic common factors perspective,[8] it is deemed essential that explanations regarding the causes of the problem provided by the therapist are consistent with the patient's understanding of the problem and that the therapeutic procedures are in concordance with this conceptualization of the problem.[9,10] The patient and therapist often have different perceptions of the patient's problem.[33,34] Research by Hagihara et al[35] identified a patient's inability to understand the doctor's explanations about a treatment, resulting from a large gap between the perception of the patient and those of the doctor, as a predictor of doctor-shopping behaviour.

These studies highlight the importance of consistency between the patient's and therapist's understanding of the problem.[33,35] It is likely that the congruence between the two perceptions influences the alliance.

The PABS-PT was designed to capture two different orientations towards LBP: a biomedical and a biopsychosocial orientation.[18,19] In particular, the biopsychosocial subscale of the PABS-PT was of interest for our research. Indeed, it might be relevant to estimate the extent to which therapists and patients consider psychological features as contributing factors to the pain experiences of patients.[22,36] Therapists who neglect or deny the influence of psychological factors may not be prepared to collaborate with patients experiencing high levels of psychological distress[3]. As a consequence, difficulties related to fostering strong alliances may arise. In contrast, patients with strong biomedical attitudes and beliefs may exhibit more resistance to participating in biopsychosocial therapy.[37] In a qualitative study, Bunzli et al[37] disclosed that patients with strong biomedical beliefs who do not change biomedical beliefs in therapy are less likely to describe a strong and trustful relationship with the patient than patients who change their beliefs regarding CLBP. The relationship between attitudes and beliefs towards CLBP and the alliance has never been explored empirically. This line of research would demand valid measures of therapists' and patients' attitudes and beliefs towards CLBP in general or regarding a patient's individual pain problem. Our data from Study 1 indicated that the German version of the PABS-PT should not be used to estimate the magnitude of the therapists' biopsychosocial orientation towards LBP. Due to these methodological concerns, we decided not to integrate the PABS-PT in later studies, which are outlined in **Part II** and **Part III**. Therefore, the studies undertaken in this doctoral research were unable to estimate relationships between therapists' and patients' attitudes and beliefs and the alliance.

There might be other measures of physiotherapists' and therapists' attitudes and beliefs than the PABS-PT that might be relevant for this line of research. The revised Illness Perception Questionnaire (IPQ-R) measures three domains of patients' illness perception, including illness identity, causes and beliefs.[38] The causes domain of the IPQ-R might be of particular interest for testing the consistency between therapists' and patients' understanding of the pain problem. This domain includes possible causes (e.g., overuse, psychological trauma, muscle disorder, and sleeping disorder) to which individuals attribute their condition.[39] Arat et al. (2016)[40] developed and validated the IPQ-R HP, which is an adapted version of the IPQ-R HR, to assess the perception of healthcare professionals concerning the health problem of an individual patient. Both instruments, the IPQ-R and the IPQ-R HP, might be promising for further research regarding the congruence between therapist's and patient's perceptions of the problem.

Therapists' Power, Expertise or Ability to Help the Patient

The psychotherapeutic common factors perspective postulates that successful treatments require a therapist who the patient believes has the power, expertise and ability to help.[8-10] Data presented in **Part III** indicate that therapists' self-reported competence and their satisfaction in managing patients predict a patient-rated alliance in physiotherapy for CLBP. Considering knowledge concerning the effect of the alliance on treatment outcomes in CLBP,[16,17] therapists' perceptions of their own ability to manage patients may also be related to treatment outcomes. In Studies 3 and 4, we focused only on physiotherapists' self-reported abilities to help. For future research, it might be relevant to also measure patients' perceptions of therapists' abilities to help.

In Studies 3 and 4, physiotherapists' self-reported variables were measured with one-dimensional statements. In psychotherapy, the effects of therapists' variables on alliance and treatment outcomes have been explored more extensively,[41-44] and through the use of complex and validated measures of therapists' variables.[32,45] Nissen-Lie et al. (2010)[32] measured psychotherapists' self-reported experiences in therapy with 21 items from the DPCCP, which is a multidimensional instrument that was originally developed for research on psychotherapists development.[46] The DPCCP, or the subscales of this extensive instrument, might be of interest for future research examining the contribution of physiotherapists' variables to the alliance in CLBP practice. In another study that investigated the effects of the therapist in psychotherapy, Schöttke et al. (2017)[45] assessed therapists' interpersonal skills and tested their relationship with treatment outcomes. Measures of psychotherapists' interpersonal skills were based on an assessment of therapists' behaviours in a group discussion (e.g., clear and positive communication, respect and warmth, and willingness to cooperate) and on a structured interview for exploring therapists' personal strength and motivation.[45] Ratings of therapists' behaviours in group discussions were associated with treatment outcomes.[45] The materials and methods used in these psychotherapy studies might be informative for future research examining therapist effects in physiotherapy practice.

Physiotherapists' interpersonal skills could be based on a similar but different construct than therapists' interpersonal skills in psychotherapy. To measure physiotherapists' interpersonal skills, it might be important to consider therapists' attitudes towards mental health and psychiatry. Physiotherapy students' attitudes and beliefs towards psychiatry and mental health seem to be moderately positive.[47,48] However, stigmatisation of mental illnesses and psychological problems persist in this field.[4,49,50] Physiotherapists with a negative affectivity towards mental illnesses might be less motivated to collaborate with patients experiencing psychological distress or those with comorbid mental illnesses. Considering the knowledge obtained from psychotherapy regarding therapist effects on the alliance and treatment outcomes,[41,42] it might be interesting for

physiotherapy research to further explore how therapists' variables relate to the alliance and treatment outcomes in physiotherapy practice.

Rituals or Procedures in Therapy

Physiotherapy research on the alliance-outcome relationship has never explored how therapists' and patients' behaviours contribute to the development of the alliance.[16] The emotional communication or reflection on patients' emotions might be an important therapeutic ritual or procedure in CLBP practice. In psychotherapy, therapists may help patients modulate their emotional state and increase their self-awareness by supporting patients to become aware and to provide space for verbalizing negative emotions.[51] The verbalization of negative emotions, particularly those related to pain experiences, could also be relevant for modifying psychological barriers to recovery in patients with CLBP.

The common factors perspective from psychotherapy posits that therapeutic rituals or procedures should be consistent with therapists' conceptual schemes that explain a patient's symptoms.[8-10] Therefore, a physiotherapist with a strong biopsychosocial orientation towards CLBP may elicit patients' expressions of psychological factors, including negative emotions and beliefs regarding the pain problem. In contrast, a therapist who does not acknowledge the potential contribution of psychological factors to a patient's pain experience is likely to avoid discussions of psychological contents. Furthermore, physiotherapists who lack confidence in managing patients with high psychological distress tend to reduce the patient's space to verbalize psychological factors in therapy. These examples illustrate potential associations between therapists' variables (e.g., attitudes and beliefs, competence, and clinical skills), patient-therapist communications and the alliance.

We considered the VR-CoDES to be a promising method for a preliminary analysis of the association between psychological communication and the alliance in physiotherapy practice. Previous research has shown that the VR-CoDES coding system provides information about whether patients' emotional communications are elicited spontaneously by the patient or prompted by the therapist, and whether the therapist provides or reduces space for further disclosures of psychological factors.[51-54] Most VR-CoDES studies have been descriptive, but the consequences of emotional communication regarding treatment outcomes and therapeutic processes, such as the development of the alliance, have never been explored.[55]

The communication analysis outlined in **Part III** aimed to measure emotional communications in CLBP practice and to explore its associations with the patient-rated alliance. This analysis was limited due to an insufficient inter-rater agreement (kappa=0.10) and by low

patient ratings for depression and anxiety in Study 4. Despite its limitations, we consider the VR-CoDES to be a promising method for future research investigating physiotherapists' skills in dealing with psychological factors and testing the consequences of communication regarding psychological factors on the alliance and treatment outcomes in CLBP practice.

6.4. Clinical Implications

Several clinical and research implications emerged from this doctoral thesis study.

Measuring Physiotherapists' Attitudes and Clinical Behaviours

The German version of the PABS-PT should be revised. Our results from EFA and CFA on the German PABS-PT indicated that the hypothesized 2-factors model may not be an adequate representation of the construct measured with the questionnaire. This questionnaire should be revised, and caution should be applied when using it to measure the magnitude of physiotherapists' biopsychosocial orientations towards LBP management.

Physiotherapists' clinical behaviours should be measured by direct observations. The findings from Study 2 showed that physiotherapists' self-reported behaviours demonstrate poor concordance with their behaviours in real clinical practice as measured by standardized patients. This was the first study to compare physiotherapists' self-reported behaviours on clinical vignettes with more direct measures of physiotherapists' behaviours in LBP practice. Direct observations of patient-therapist interactions are deemed essential for further investigations regarding the relationship between therapists' and patients' behaviours in alliance and treatment outcomes.[16] Direct observations and behavioural analyses require technology and are very time consuming. Nevertheless, such efforts might be beneficial for this line of research. Measures of therapists' and patients' behaviours in physiotherapy may help to further explore how therapists' and patients' behaviours in therapy relate to the alliance and treatment outcomes in CLBP.

Physiotherapists' Ability to Identify and Address Psychological Factors

Physiotherapists should screen for prognostic risk factors and psychological factors. Study 3 confirmed the results of previous research demonstrating that physiotherapists exhibit poor accuracy in allocating patients into risk groups (risk stratification)[28] and in describing psychological factors based on an intuitive clinical assessment.[29,30] These consistent findings imply that physiotherapists should be advised to integrate standardized screening questionnaires into their assessments of psychological factors and for risk stratification[26,27]. However, the communication analysis conducted in Study 4 illustrated the possibility that some patients may not report negative emotions on psychological screening questionnaires, but they may express such emotions during the intake session. Therefore, physiotherapists should be aware of the limitations of self-reported patient questionnaires (e.g., reporting bias) and should be advised not to rely on screening tools alone. Physiotherapists should combine patient questionnaires with their clinical observations and the information obtained from patient interviews.[50]

Physiotherapists' Contribution to the Alliance in CLBP Practice

Physiotherapists should be aware of therapist effects - or the importance of the therapist as a person. In psychotherapy, there is evidence for the effects of the therapist on the alliance and on treatment outcomes.[32,41,56] The results from Study 4 indicated that therapists' self-reported variables influence the alliance in physiotherapy for CLBP. Our study represents the first empirical investigation of factors associated with the alliance in physiotherapy practice. Keeping in mind the methodological limitations of Study 4, our findings indicated that physiotherapists should be motivated to reflect on their own experiences in therapy. Physiotherapists should be aware that the therapist as a person, and not only the therapeutic techniques they provide for the patient, may have the potential to influence patient symptoms. In general, physiotherapy may benefit from bringing the therapist, as well as the patient, into the spotlight of research and clinical practice.

6.5. Limitations and Future Directions

The following section highlights limitations that should be kept in mind during discussions of the conclusions drawn from this doctoral research. Additionally, this section recommends directions for future research examining the common factors perspective in physiotherapy for patients with CLBP.

Limitations

Part I - Studies 1 and 2

Low response rate to the PABS-PT. In Study 1 on the German PABS-PT, the response rate to the online questionnaire was low (37%) in the group of physiotherapists. The characteristics of participating physiotherapists and physiotherapy students were comparable to the characteristics of the study participants in a previous validation study on the German PABS-PT.[21] However, the low response rate in Study 1 may have resulted in a sampling bias and may have limited the generalizability of our results from the German version of the PABS-PT to other language versions of the questionnaire. Furthermore, our study and the previous validation study on the German PABS-PT[21] both included mainly therapists specialized in manual therapy, and only a few physiotherapists were trained in more biopsychosocial oriented treatment approaches (e.g., cognitive behaviour therapy and neurophysiological education). Therefore, it is unclear how well these samples represent populations of physiotherapists from countries where more physiotherapists receive training in biopsychosocial oriented approaches.

The reliability of measures of standardized patients is unknown. Study 2 compared physiotherapists' self-reported behaviours (clinical vignettes) with measures of standardized patients. Standardized patients are considered a gold standard test for testing patient-therapist interactions in clinical practice.[57] Nevertheless, the reliability of measures of standardized patients in physiotherapy practice remains unknown.

Parts II and III - Studies 3 and 4

Single-centre studies (Study 3 and Study 4). The results regarding physiotherapists' self-rated variables and the patient-rated alliance were derived from single-centre studies. Studies 3 and 4 were both conducted in one specific clinical setting (ambulant physiotherapy clinic at a public hospital in Switzerland). This limitation may restrict the generalizability of our results to other settings such as inpatient settings or private physiotherapy clinics.

Small sample size in Study 4. The sample size, or the number of included observations in the statistical analysis, was small in Study 4. The sample size (N=16) allowed the inclusion of 8 parameters in the linear mixed model. However, the small sample size limited the precision of estimated coefficients or effects in this statistical model. The inclusion of more observations may have provided more robust estimations of effects or a narrowing of confidence intervals. The potential problem of impressions should be considered when interpreting the preliminary evidence for the relationship between therapists' self-reported variables and the patient-rated alliance.

Selection of predictor variables for linear mixed models. The linear mixed models in Study 3 and Study 4 included only a small number of selected patient and therapist variables. Both studies focused on therapists' self-reported variables and patient-reported distress at treatment baseline. Other potentially relevant predictor variables were not considered, such as patient-reported depression and anxiety or gender. Our focus on a very small number of predictor variables was mainly due to the small sample size, which restricted the inclusion of more parameters but also to the low rates of depression and anxiety found in the samples in Study 3 and Study 4.

Influence of the observer on therapists' and patients' behaviour. In Study 3 and Study 4, participating physiotherapists worked in the same institution as the principal investigator of the study. The rather close contact with the observers could have influenced physiotherapists' behaviour and their self-reported variables. We aimed to reduce the influence of the observer on participating physiotherapists by blinding them to the specific study objectives. The limited and standardized information given to the therapists may have helped reduce the potential bias in therapists' self-reported variables.

Measures of the alliance in physiotherapy. In Study 4, the alliance was measured with the short form of the Working Alliance Inventory (WAI-SR).[58] This instrument seems to be appropriate for measuring the alliance in psychotherapy,[58,59] but the instrument has never been validated in physiotherapy.[60,61] It remains unclear to what extent the constructs of the Working Alliance Inventory or the WAI-SR capture the patient-therapist alliance in physiotherapy practice.

Future Directions

Validation of Research Methods

Revision of the PABS-PT. Our findings from Study 1 may question the validity of the German version of the PABS-PT, and the hypothesized 2-factor model on the PABS-PT. Future studies should address whether our negative results regarding the 2-factor model on the German PABS-PT can be generalized to other language versions of this questionnaire. Additionally, PABS-PT items that were not related to the biomedical factor (factor 1) should be further explored. Additional explorative factor analysis approaches should be applied on PABS-PT items to examine other latent factors. Further, it should be determined whether the 'biopsychosocial scale' can be improved by adding new items related to biopsychosocial attitudes and beliefs towards LBP.

Exploring the construct of the alliance in physiotherapy. In Study 4, we measured the patient-reported alliance with the WAI-SR, which is the short version of the WAI. The construct of the WAI, which

is one of the most commonly used instruments for measuring the alliance,[13] was developed and validated in psychotherapy.[62,63] This instrument, similar to other measures of alliance, has never been validated in physiotherapy practice.[60] It would be interesting to evaluate whether this or other factors are related to the patient-therapist alliance in physiotherapy.

Physiotherapists' Ability to Address Psychological Factors and Foster Alliances

Identifying psychological factors. Findings from the research outlined in this doctoral thesis indicate that physiotherapists have difficulties identifying and describing psychological factors. In Study 3, the correlation between patient questionnaires and physiotherapists' clinical impressions on psychological factors was modest at best. Furthermore, in the communication analysis outlined in **Chapter III**, the physiotherapist rater recognized only 50% of patient concerns identified by the psychologist. This contrast between the psychologist and the physiotherapist rater supports the hypothesis that extensive psychological training enhances healthcare professionals' skills to identify psychological content in clinical practice. Differences between health professions regarding their ability to identify psychological factors would be interesting for further explorations. Generally, differences between and within physiotherapists regarding their ability to address psychological factors and foster alliances with their patients should be explored further.

Effects of educational programmes. Future research should examine whether a high-quality educational programme on psychological and psychiatric features has the potential to enhance physiotherapists' ability to foster alliances in clinical practice. Table 2 presents suggestions for professional knowledge, skills and attributes that physiotherapists may need in their daily clinical practice to effectively address psychological factors. Further research in this direction would increase knowledge regarding effective educational programmes for physiotherapists and the importance of embedding psychological perspectives within physiotherapy education.[3]

Table 2: Essential Professional Competencies (Knowledge, Skills and Attributes) Required for Musculoskeletal Physiotherapists Management of Chronic Low Back Pain, Based on Probst and Brunner (unpublished)[64]

Professional Knowledge	- Biopsychosocial model. - Basic theoretical models of psychological interventions in chronic pain (e.g., fear-avoidance model).[65] - Assessment of psychological factors associated with musculoskeletal disorders based on questionnaires (e.g., 4DSQ, SBT or TSK), clinical observations and patient interviews. - Overview of mental illnesses. - Associations between mental health, physical activity and physical exercises - The concept and role of the alliance.
Professional Skills	- Communication skills in mental health, including body language, empathy and basic skills in Motivational Interviewing.[66] - Relaxation techniques (e.g., Progressive Muscle Relaxation). - Application of psychological approaches based on the fear-avoidance model (e.g., Graded Activity, Exposure In Vivo).[67]
Professional Attributes	- Having a positive attitude towards mental health and psychiatry. - Demonstrating a commitment to support patients with psychological problems and mental illnesses. - Establishment of strong and positive relationships (alliances) with patients. - Demonstration of motivation for self-reflection to improve clinical skills.

4DSQ = Four-Dimensional Symptoms Questionnaire; SBT = STarT Back Tool; TSK = Tampa Scale of Kinesiophobia.

Associations Between Alliance, Therapist Variables and Patient Variables

Testing how the alliance evolves in physiotherapy. For future research on the alliance in physiotherapy, we recommend considering repeated measurements of the alliance and not just single point measures. Previous studies examining the alliance-outcome relationship in physiotherapy measured only the patient-rated alliance in the early phase of therapy.[15-17] Repeated measures would allow an examination of the evolution of the alliance in therapy. Such research could examine, for example, whether a weak early alliance in early therapy can be enhanced later during therapy.

Relationship between the alliance and patient symptoms. Positive alliance ratings measured early at the start of the treatment may be associated with early changes in patient symptoms. In psychotherapy for eating disorders, changes in patient symptoms are associated with subsequent alliance ratings.[69] Future physiotherapy research should therefore address to what extent the changes in symptoms are related to the alliance ratings.

Associations between alliance and therapists' and patients' behaviours. In Study 4, we aimed to explore associations between patient-therapist communications and the alliance. Unfortunately, the results from the analysis of this communication (based on the VR-CoDES) were inconclusive. The VR-CoDES coding of cues following negative emotions was biased by a poor inter-rater agreement. These findings support the need for further investigations to test the reliability and applicability of this method in physiotherapy settings. For future research, we further recommend assessments of the associations between therapists' and patients' behaviour and alliance in samples with high levels of depression and/or anxiety, since the effects of therapists' and patients' behaviours on the alliance might be strongest in these patients. The communication analysis presented in Study 4 focused only on *emotional communication* in physiotherapy. Additional research is needed to investigate patient-therapist interactions in physiotherapy to measure other behaviours associated with the formation of an alliance. This research should explore the use of behavioural observations for assessing patient and therapist variables, such as interpersonal skills or therapists' clinical skills.

Associations between patient and therapist variables and the alliance. Study 4 indicated that therapists' self-reported experiences in therapy (competence and satisfaction) may contribute to the alliance in physiotherapy. Our explorative investigation of predictor variables of the alliance was limited to a small number of selected variables. Future research on the common factors perspective in physiotherapy should consider other patient and therapist variables (e.g., personality, motivation, and expectations). Figure 1 presents an overview of factors that have been hypothesized to contribute to the alliance in physiotherapy.

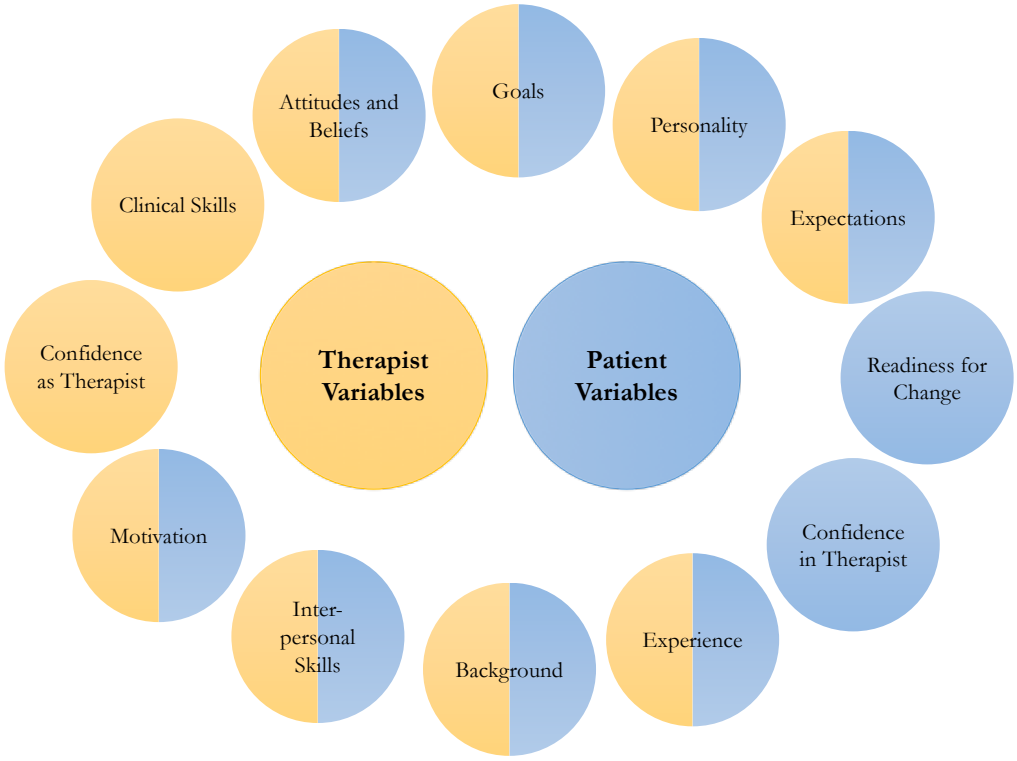

Figure 1: Therapist and Patient Variables Hypothesized to Contribute to the Alliance in Physiotherapy (adapted from O'Sullivan et al.[71]).

Difference between therapists' and patients' alliance ratings. In physiotherapy, therapists' perspectives or their experiences of the patient-therapist alliance have never been measured in physiotherapy practice. Psychotherapy research has shown that patient and therapist ratings of the alliance were moderately correlated (r = .36), but that patients rated the alliance as more positive than therapists.[68] Intriguingly, the discrepancy between patient and therapist ratings was larger in patients with milder psychological disturbances than in patients with more disturbances.[68] More knowledge regarding the divergence between patients' and therapists' alliance ratings in physiotherapy may facilitate clinicians' evaluations and reflections regarding the development of the alliance in clinical practice.

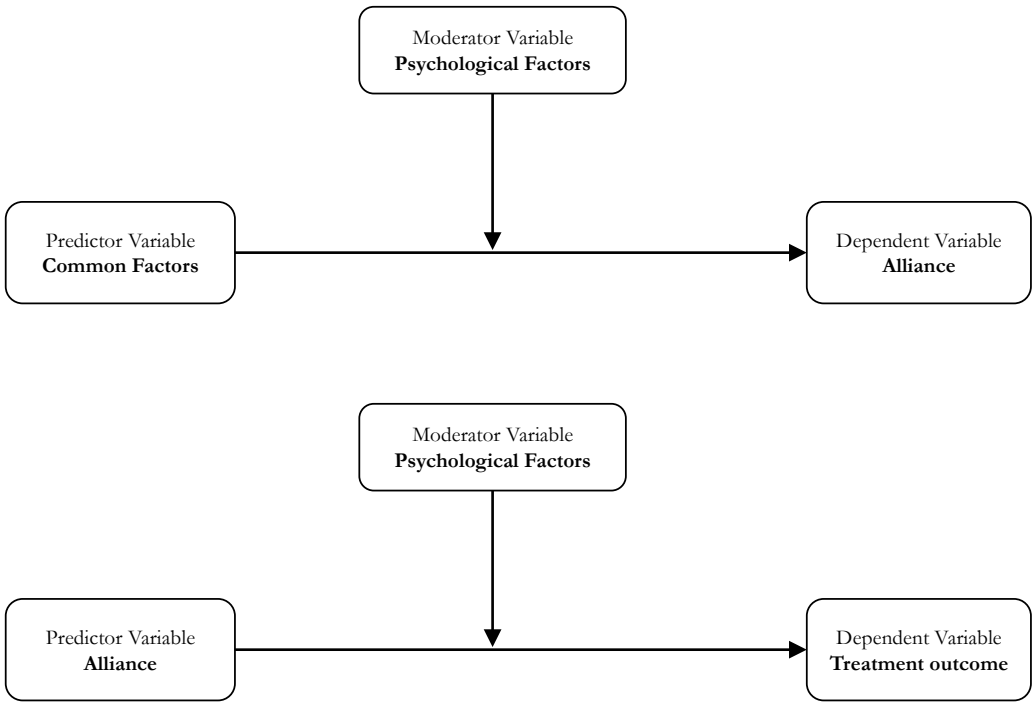

Figure 2: Diagrams of Possible Moderator Models Describing the Potential Influence of Patients' Psychological Factors on the Effect of Common Factors in Physiotherapy Practice.

Applicability of the Common Factors Model in Physiotherapy

The common factors model might be relevant in physiotherapy for CLBP.[70] However, there is only a small body of evidence for a positive alliance-outcome relationship in physiotherapy for CLBP.[15-17] Additional research is needed to evaluate associations between common factors and to explore relationships between common factors and treatment outcomes in physiotherapy practice.

The influence of common factors should be evaluated in different physiotherapy settings and across different treatment approaches. It is likely that common factors are highly relevant in physiotherapy treatments for patients with dominant psychological problems (e.g., psychological distress, catastrophizing, and depressive or anxiety disorders) but less important in patients with dominant mechanical problems. This assumption is supported by our results from Study 4 that indicated physiotherapists' contribution to patient-rated alliance depend on the level of patient psychological distress. Figure 2 illustrates this potential interaction between common factors and patients' psychological factors in physiotherapy practice. Future research should investigate the relevance of common factors across different patient groups and different treatment approaches.

6.6. Conclusions

Research examining common factors has a long history in psychotherapy.[8,9,11] In contrast, the literature in physiotherapy examining the common factors perspective remains very limited.[70] For the management of CLBP, there is evidence for the alliance-outcome relationship. Studies indicate that a strong alliance predicts improvements in physiotherapy.[15-17] The studies outlined in this doctoral research investigated aspects of some common factors in CLBP and explored physiotherapists' contributions to the alliance. The following main conclusions can be drawn based on the results of this thesis:

- The German version of the PABS-PT is not sufficient for measuring physiotherapists' biopsychosocial attitudes and beliefs towards LBP.

- Physiotherapists' treatment behaviours should be measured via direct observations in clinical practice since clinical vignettes are not valid measures of physiotherapists' clinical behaviours.

- Physiotherapists do not accurately allocate patients into risk stratification groups or identify psychological factors, especially for depression, anxiety and kinesiophobia.

- Patient-reported distress is a negative predictor of physiotherapists' self-reported competence in managing patients in CLBP practice.

- It is likely that physiotherapists' perceptions of their own competence and satisfaction in managing patients have positive effects on patient-rated alliances in CLBP practice. Effects of therapist-reported variables on the alliance might be strongest in patients reporting high psychological distress at baseline.

Measuring 'common' factors in physiotherapy practice is highly challenging. This doctoral thesis represents a novel explorative investigation of possible associations between common factors in physiotherapy for CLBP. The findings from this doctoral research should help further construct a foundation for research on common factors in physiotherapy practice.

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Personal Contribution

All authors made an intellectual contribution to this doctoral thesis.

The four studies were designed and written by Emanuel Brunner, Wim Dankaerts and Michel Probst. Aureliano Crameri contributed to the design and organisation of the Study 4.

Emanuel Brunner conducted the data collection for all studies. Christoph Bauer and Susanne Rüttimann contributed to the data collection in the Study 4.

André Meichtry did the statistical analysis for the Studies 1 and 2, and Emanuel Brunner for the Studies 3 and 4.

All co-authors of the four studies contributed significantly to the interpretation of research data, drafting of the manuscripts, and revising of the manuscripts.

Conflict of Interest Statement

All authors declare that they have no competing interests.

Summary / Samenvatting

7. Summary / Samenvatting

7.1. Summary

The psychotherapeutic common factors perspective describes the mechanisms by which psychotherapy produces benefits for patients, including common factors, expectations and specific therapeutic techniques.[1] The common factors are those factors necessary for improvements in therapy: a patient-therapist relationship (or alliance), a therapist who the patient believes has the power to help, a rational or conceptual scheme that explains the problem, and a procedure that is consistent with the conceptual scheme provided to the patient.[1-5] In psychotherapy, there is strong evidence for the influence of the alliance on treatment outcomes,[6-9] and for the effect of therapists' variables on the alliance and treatment outcomes.[10,11]

In contrast, the literature examining the common factors perspective in physiotherapy remains very limited.[12] There is preliminary evidence for the alliance-outcomes relationship in rehabilitation of CLBP, indicating that a strong patient-therapist alliance predicts patient improvement in therapy. [13-15]

The general aim of this doctoral thesis was to measure common factors that might be relevant in physiotherapy for patients with CLBP and to examine how physiotherapists' variables contributes to the alliance.

In **Part I**, we validated measurements that were considered promising for research on relationships between therapists' variables and the alliance in CLBP practice. Several studies have used the PABS-PT and clinical vignettes to examine the relationship between therapists' orientations towards LBP management (biomedical and biopsychosocial) and their treatment behaviours.[16-18] There have been concerns regarding the validity of these methods.[19,20] Indeed, our factor analyses in the German version of the PABS-PT (Study 1) indicated that caution is needed when using this questionnaire to estimate physiotherapists' attitudes and beliefs towards LBP. In Study 2, we demonstrated that physiotherapists' self-reported behaviours on clinical vignettes was in poor concordance with their behaviours measured by standardized patients in real clinical practice. Based on the findings from **Part I**, we decided not to include the PABS-PT in later studies and to observe the patient-therapist interaction directly in real clinical practice.

In Study 3, as outlined in **Part II**, we identified patient-reported psychological distress as a negative predictor of physiotherapists' self-reported competence to manage patients. Furthermore, this study demonstrated poor accuracy of physiotherapists to identify psychological factors in patients with CLBP. The results from our pragmatic observational study are consistent with

findings from previous qualitative studies showing that physiotherapists often feel unprepared to assess and address these psychological factors in CLBP.[21-23]

The results outlined in **Part III** indicated that physiotherapists' self-reported competence and their satisfaction in managing the patient were related to the patient-rated alliance. Linear mixed models of the patient-rated alliance showed that the effects of physiotherapists' self-reported variables (competence and satisfaction) were moderated by patients' psychological distress at baseline. Study 4 indicates that it is likely that the association between physiotherapists' variables and the patient-rated alliance was strongest in patients who reported high levels of psychological distress at baseline.

The findings from this doctoral thesis showed that physiotherapists experienced difficulties in managing patients with psychological distress. Furthermore, our results provide preliminary evidence for the association between therapists' variables and the patient-rated alliance in CLBP practice. Overall, this doctoral thesis highlights that both the therapist and the patient should receive attention in future physiotherapy research and practice. This line of research should increase our knowledge of the therapeutic mechanisms in CLBP practice and provide a better understanding of what physiotherapists need to do to manage these 'complex' patients with psychological distress in their clinical practice.

7.2. Samenvatting

In het psychotherapeutisch proces spelen naast de specifieke therapeutische technieken ook de algemene factoren een zeer belangrijke rol [1]. De aanwezigheid van deze algemene factoren blijken eveneens noodzakelijk voor verbeteringen door therapie. Onder algemene factoren wordt verstaan: de verwachtingen van de patiënt, de patiënt-therapeut relatie (of alliantie), de therapeutische kwaliteiten (vertrouwen), een rationeel/conceptueel schema dat de problematiek en de gehanteerde behandelingsprocedure (consistent met dit schema) verduidelijkt.[2-5] In psychotherapie draagt o.a. de alliantie in grote mate bij tot het behandelingsresultaat.[6,8,9] Vooral de variabelen die gelinkt worden aan de therapeut hebben een duidelijke bijdrage tot het behandelingsresultaat.[10,11]

In het domein van de kinesitherapie is de literatuur over de invloed van algemene factoren eerder beperkt.[12] Er zijn er duidelijke aanwijzingen dat in de kinesitherapeutische behandeling van bijvoorbeeld chronische lage rug pijn (CLRP) deze alliantie een belangrijke rol speelt.[13-15] Onderzoek geeft aan dat een sterke patiënt – therapeut alliantie een goede voorspeller van het therapeutisch proces zou kunnen zijn. De variabelen gelinkt aan de kinesitherapeut die de alliantie

zouden kunnen beïnvloeden zijn echter nooit onderzocht. Het doel van dit proefschrift was om binnen het domein van de kinesitherapie meer duidelijkheid te scheppen over de alliantie therapeut – patiënt, meer bepaald de veel voorkomende algemene factoren bij patiënten met CLRP te onderzoeken. Bijkomend werd ook de rol van de kinesitherapeut op de alliantie onderzocht.

In **Deel I**, werden een aantal instrumenten gevalideerd die als veelbelovend in het onderzoek naar de invloed van therapeutvariabelen op de alliantie en behandelingsresultaten werden beschouwd. De keuze viel op de Pain Attitudes and Beliefs Scale (PABS-PT) en klinische vignetten die veelvuldig worden gebruikt om de relatie tussen de therapeutische visie op CLRP (biomedisch en biopsychosociaal) en het behandelingsgedrag te onderzoeken.[16-18] Niettegenstaande het frequent gebruik, rijzen er vragen over de validiteit van de PABS-PT en de klinische vignetten.[19,20] Factoranalltisch onderzoek van Duitse versie van de PABS-PT (Studie 1) gaf inderdaad aan dat deze vragenlijst met enige voorzichtigheid moet worden gebruikt, zeker wanneer het gaat over het peilen naar de biopsychosociale attitudes en overtuigingen van kinesitherapeuten ten opzichte van de behandeling van CLRP.

Studie 2 toonde aan dat het zelf-gerapporteerde gedrag door middel van klinische vignetten maar matig overeenstemt met het klinisch gedrag van kinesitherapeuten in de dagdagelijkse praktijk. Op basis van de resultaten uit Deel I, werd beslist om de PABS-PT niet te integreren in de verdere studies, maar te opteren voor de observatie van de patiënt – therapeut interactie in de reële klinische praktijk.

In **Deel II** (Studie 3) werd in de behandeling van de patiënt met CLRP de door de patiënt gerapporteerde psychologische distress, gemeten na de intakesessie. Deze distress werd geïdentificeerd als een negatieve voorspeller van de door de kinesitherapeut zelf-gerapporteerde competentie. Bovendien toonde deze studie aan dat kinesitherapeuten niet erg nauwkeurig zijn in het identificeren van psychologische factoren bij patiënten met CLRP. De resultaten van deze observationele studie komen overeen met de bevindingen van meer kwalitatieve studies die aantoonden dat kinesitherapeuten zich vaak onvoorbereid voelen om psychologische factoren bij patiënten met CLRP te beoordelen en om ermee om te gaan tijdens de therapie.[21,22,24]

In **Deel III**, is gekeken naar de relatie tussen de zelf-gerapporteerde competentie en patientgerichte alliantie. De resultaten in Studie 4 tonen aan dat de zelf-gerapporteerde competentie en tevredenheid van kinesitherapeuten tijdens de therapeutische benadering bijdragen tot een patiëntgerichte alliantie. De lineair gemengde statistische modellen op de patiëntgerichte alliantie toonden aan dat het effect van de door kinesitherapeuten zelf-gerapporteerde variabelen (competentie en tevredenheid) afnamen wanneer patiënten bij aanvang van de behandeling psychologische distress. Deze bevindingen geven aan dat de bijdrage van de therapeut tot de

alliantie het sterkst zou kunnen bijdragen bij patiënten die een hoge psychologische distress ervaren.

Bevindingen uit dit proefschrift hebben verder aangetoond dat het waarschijnlijk is dat de door de kinesitherapeuten zelf-gerapporteerde variabelen bijdragen tot de alliantie in de CLRP-praktijk. Onze resultaten geven aan dat naast depatiëntook de kinesitherapeut en in het bijzonder de relatie tussen beide de focus van toekomstig onderzoek naar het effect van de behandeling van CLRP moet worden. Deze nieuwe onderzoekslijn moet bijdragen tot het verruimen van de kennis over de therapeutische mechanismen in kinesitherapie en het beter begrijpen van de noden van kinesitherapeuten bij de behandeling van patiënten met psychologische distress in de klinische praktijk.

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Appendix

Appendix I - Book Chapter

Physiotherapy for patients with chronic low back pain and comorbid mental illnesses

Emanuel Brunner[1,2] and Wim Dankaerts[3]

[1] Adapted Physical Activity and Psychomotor Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

[2] Institute of Physiotherapy, Kantonsspital Winterthur, Winterthur, Switzerland

[3] Musculoskeletal Rehabilitation Research Unit, Department of Rehabilitation Sciences, University of Leuven, Leuven, Belgium

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Abstract

Mental illnesses are highly prevalent in people suffering from chronic low back pain (CLBP). Complex patients with CLBP and co-morbid somatization, depression and anxiety disorders are often seen by physiotherapists in outpatient practice. In this clinical setting the support of clinical psychologists and psychiatrists is often limited. Physiotherapists are therefore challenged to integrate psychological principles and strategies into their clinical management. This chapter provides a brief overview of biopsychosocial assessment and treatment strategies relevant for a patient-centred intervention for patients with CLBP and co-morbid mental illnesses.

Background

Psychosocial factors and psychopathologies play an important role in non-specific chronic low back pain (CLBP). Non-specific CLBP is defined as pain and discomfort in the lower back, not attributed to recognisable specific pathology and lasting for longer than 12 weeks.[1] Patients' cognitions (such as negative LBP beliefs, catastrophising and fear of movement), emotions (such as anxiety and depressed mood) and behaviour (such as fear-avoidance behaviour) play a crucial role in the development and maintenance of chronicity,[2] and the prevalence of clinically relevant mental illnesses is high.[3] Patients with CLBP and co-morbid mental illnesses are often described as complex pain patients. Physiotherapists see these patients within multidisciplinary rehabilitation settings, but also or even more often in outpatient practice where the support of other health care providers (e.g. clinical psychologist, psychiatrist) is sparse or even absent. Therefore, physiotherapists involved in the management of CLBP are challenged to effectively deal with psychosocial factors and mental illnesses.

The vicious circle of chronicity due to musculoskeletal pain is explained by the fear-avoidance model,[2] which describes that people who catastrophically (mis)interpret their pain experience (catastrophising), may avoid pain-related movements, become hypervigilant to bodily sensations, and consequently are at risk of developing disability and depressive mood. Longitudinal studies have confirmed these psychosocial risk factors, based on the fear-avoidance cycle, as strong predictors of chronic pain and disability.[4-6]

Additionally to these psychosocial risk factors, co-morbid mental illnesses are frequent in CLBP. Persons with mental disorders suffer more often from chronic back pain compared with individuals without mental disorders (29% vs 16%).[7] Generally, the prevalence of psychiatric co-morbidity is high in patients with CLBP.[3,8] In the USA, it was shown that 38% of patients who were sick-listed with CLBP had at least one clinically relevant mental illness diagnosed by applying the Mini-International Neuropsychiatric Interview,[9] with somatoform pain disorders as most prevalent diagnosis, followed by anxiety and major depressive disorders.[3] Similar results were found in Germany, but with depression as the most prevalent diagnosis.[8] These epidemiological findings indicate the significance of psychiatric co-morbidity in CLBP. From a Cognitive Behavioural Therapy (CBT) perspective, it can be assumed that the development of pain-related disability and psychological disturbances are based on similar processes. The cognitive model proposes that dysfunctional thinking, which influences mood and behaviour of patients, is common to all psychological disturbances.[10] Therefore, persons with mental illnesses may also have a tendency to catastrophically (mis)interpret their pain experience. But although psychosocial factors and mental

illnesses are highly relevant in complex CLBP, the clinical picture is complemented by additional physical and behavioural factors.

Alterations of the nervous system are frequently present in CLBP.[11] Central sensitization is defined as an augmentation of responsiveness of central neurons to input from receptors,[12] resulting in an increased responsiveness to peripheral stimuli and decreased load tolerance to senses from the neuro-musculoskeletal system. It is likely that the abnormal central pain processing facilitates the hypervigilance to bodily sensations in those patients who are trapped in the fear-avoidance cycle. Generally, complex pain patients often complain about symptoms that cannot be accounted for medically and are potentially related with central sensitization.

Additionally, CLBP is often associated with maladaptive functional behaviour. These patients perform a task in a manner that results in provocation of pain and disability.[13] Experimental studies showed that patients with CLBP have both increased and decreased levels of abdominal wall and lumbar muscles co-activation.[14] Excessive (protective) muscle activation during movements may result in increased and abnormal loading forces across pain sensitive structures.[15] Maladaptive movement behaviours resulting in self-provocation might be related with altered sensorimotor integration, decreased body awareness and maladaptive cognitions. In this context, it is stated that this behaviour is reinforced by beliefs regarding core stability and training methods that tend to address (excessive) training of trunk stabilising muscles.[15] Further, it is often seen that psychological disturbances and maladaptive functional behaviours result in decreased levels of physical activity and physical fitness. A meta-analysis showed that patients with chronic disability are likely to have low physical activity levels.[16] It can be hypothesized that physical activity and physical fitness might be even lower in patients with co-morbid mental illnesses than in the general sample of CLBP. Longitudinal studies disclosed a bi-directional association between physical activity and depression. Individuals with low levels of physical activity are at significant higher risk to develop depression than those with high levels of activity, and depression is a significant risk factor for developing a sedentary life-style.[17,18] Additionally, sedentary life-style and low physical fitness is often associated with other negative life-style factors, such as overweight, unhealthy diet, smoking and sleep disturbances. Being physically active is important for patients with CLBP. Some patients with CLBP, however, might be over-active meaning that their physical fitness is insufficient for their physical activity levels. Their constant physical over-use may result in fatigue and enhances sensitisation of the central nervous system. In summary, patients with CLBP and co-morbid mental illness present with a complex multidimensional symptomology. Physiotherapists are challenged to understand patients' individual pain problem, and furthermore, to target interventions at the patients' dominant driver(s) of the on-going pain problem.

Assessment

The clinical assessment of patients with CLBP is highly challenging. Most patients have long hi-'stories' of LBP and unsuccessful treatments. This often results in resistance towards new therapeutic interventions. Consequently, establishing a positive therapeutic relationship from the start might be quite difficult but is deemed essential. Indeed, the strength of the therapeutic alliance predicts positive treatment outcomes in CLBP.[19,20] This therapeutic alliance is defined as the strength of the collaborative relationship between therapists and patients, including the agreement on goal setting and tasks, and the emotional bond.[21] Techniques of Motivational Interviewing[22] can allow the development of this required strong therapeutic alliance. Generally, physiotherapists are challenged to develop effective communication skills in order to actively listen to the patients' story and to explore the multidimensional nature of the symptomology.[23]

CLBP is a complex disorder associated with a complex interaction of factors. In order to address the multidimensional nature of the problem. The assessment should be based on a multidimensional clinical reasoning framework that incorporates the contemporary biopsychosocial understanding of CLBP,[23] to identify modifiable and non-modifiable factors associated with patient's individual pain problem.[24] The aim of the clinical assessment is to develop multidimensional patient-centred interventions.

Psychosocial Factors and Mental Illnesses

Standardized screening tools should guide the physiotherapist during the patient interview for the exploration of psychosocial factors and symptoms related with mental illnesses. Additionally, the scores from patient questionnaires can support the clinical reasoning processes. The SBT[25] and the Orebro Musculoskeletal Pain Screening Questionnaire (OMPSQ)[26], are both questionnaires developed for the psychosocial screening, mainly for identifying factors associated with the fear-avoidance cycle. Alternatively, more extensive instruments can be used to identify maladaptive cognitions, such as the Fear-Avoidance Beliefs Questionnaire (FABQ)[27] or the Pain Catastrophising Scale (PCS)[28]. While these screening tools provide valuable impressions regarding psychosocial risks factors, in patients with co-morbid mental illnesses they are often insufficient for exploring the whole psychological symptomology. Therefore, it is recommended to use more extensive instruments for the assessment of psychological distress and symptoms of psychopathologies, such as e.g. the Four-Dimensional Symptom Questionnaire (4DSQ).[29] The 4DSQ is a valid and reliable instrument for measuring somatization, distress, anxiety and depression in general practice patients.[29] These four subscales do sufficiently capture the psychological symptomology in complex CLBP.

Maladaptive Posture and Movement and Pain Behaviour

The observation of patients' functional posture and movement behaviour should include the evaluation of adaptive (protective) and maladaptive (provocative) movement behaviours.[13] It is demonstrated that patients with CLBP often posture and move themselves with increased levels of co-contraction of the trunk muscles during pain provocative tasks (e.g. sitting, bending forward, standing up from sitting, walking), and they present with an inability to relax their abdominal and lumbar muscles.[15] When maladaptive posture and movement behaviours are present, it is further relevant to assess patients' body schema and body awareness.

Central Sensitisation

Recognizing symptoms related with alterations of the nervous systems is highly relevant in the management of CLBP. Information regarding the following aspects is used for the assessment: medical diagnosis, medical history, clinical examination, and the analysis of treatment responses to past interventions.[30] Hypersensitivity to touch during manual palpation should alert the physiotherapist and indicates more detailed assessments of central sensitisation. The detailed procedure for assessing central sensitisation is described elsewhere (see: Yunus, 2007[31]).

Physical Activity and Physical Fitness

Accurate quantification of physical activity and physical fitness is essential in terms of designing a patient's specific treatment programme and in measuring treatment outcomes.[32] In complex CLBP, activity diaries are useful for capturing patients' physical activity level. While this subjective method of measurement might be of limited validity and reliability,[33] the instrument can build an important basis for later physical activity counselling. More objective measures of physical activity (e.g. pedometers, accelerometers) may provide more valid measurements,[32] but are less convenient in day-to-to clinical practice. The assessment of physical fitness should, at the minimum, include a test of cardiorespiratory fitness, for example by use of treadmill or bicycle tests. More valid and reliable assessment of physical fitness such as the Eurofit for adults,[34] tend to be too demanding for patients with high levels of disability. Generally, the assessment of physical activity is delicate in complex CLBP, because of patients' strong negative affectivity towards tests targeted at their pain-related impairments, resulting in potentially low adherence to strict test protocols.

Intervention

Physiotherapy should target modifiable factors related to the on-going pain disorder including psychosocial factors and symptoms of co-morbid mental illness. However, treating complex CLBP solely with psychology-based approaches will often be insufficient since these psychological factors are likely inter-related with other factors (e.g. physical factors, neurophysiological factors) as part of the multidimensional nature of CLBP.

Patient Education

Pain physiology education has a positive influence on maladaptive pain cognition in CLBP,[35] as well as in patients with chronic widespread pain.[36] Extensive pain physiology education is indicated when the clinical picture is characterized and dominated by central sensitisation and maladaptive pain cognitions are present.[37] The goal is to reconceptualise patient's understanding of pain and the knowledge about the influence of hypersensitivity of the central nervous system. Useful clinical recommendations about pain physiology education in musculoskeletal pain have recently been published, and can build the basis for this education on pain physiology. Additionally, useful material for patient education can be found on research-based webpages (e.g. *www.pain-ed.com* or *www.paininmotion.be*). In complex pain patients, psycho-education regarding the influence of psychological distress and mental illness on the experience of pain needs to be integrated. Generally, education may help patients to self-reflect about the association between the different inter-related factors and their body, particularly their experience of pain.

Cognitive Behavioural Therapy Based Treatment Strategies

CBT is promising in CLBP with co-morbid mental illnesses, since CBT aims to alter maladaptive cognitions, emotions and dysfunctional behaviours. Clinical treatment guidelines recommend the use of CBT in CLBP.[38] However, it is often unclear what CBT-based approaches consist of and how the treatment can be applied. McCracken & Morley (2014)[39] classified CBT approaches into the following four models: operant behavioural, traditional cognitive behavioural, fear avoidance, and psychological flexibility.[39] This classification provides a useful overview about current concepts and theories, and allows a discussion regarding applicability of CBT-based approaches in physiotherapy practice.

Graded activity is an individual, gradually increasing exercise program, which is based on principles of the operant behavioural model (behaviour controlled by external situations). Although previous studies found insufficient evidence for graded activity in patients with CLBP,[40] the

strategy appears to be clinical valuable for complex CLBP in physiotherapy. During graded activity, exercise quotas are used for increasing general activity levels, which are gradually built-up towards a realistic predefined goal. Compared to other, more cognitive oriented approaches, graded activity might be more suitable in patients without interests in psychological issues and limited languages skill, because of its primary focus of patients' functional ability.

A similar gradually increasing exercise programme is exposure in vivo, which aims to restore patients' functioning and decrease limitations. This approach aims to systematically reduce pain-related fears (fear-avoidance cycle). In comparison to graded activity, exposure in vivo is superior in diminishing pain-related fears and pain catastrophising, but not different in improving functional disability and pain.[41] Detailed descriptions of this exposure in vivo treatment strategy can be found elsewhere.[42] In short, first fear-hierarchies are established, subsequently patients are exposed to fear-eliciting activities by use of behavioural experiments. The application of this approach seems more challenging for physiotherapists than graded activity, and may require advanced skills of cognitive restructuring.

Traditional CBT interventions are grounded on the 'cognitive model of depression' described by Aaron Beck[43] and might be most promising in the treatment of patients with complex CLBP. In CBT there is always a CBT-formulation, which aims to develop working models of patient's individual psychological disturbances.[10] Thereby, therapists help patients, by the use of Socratic questioning (Padesky, 1993) and strategies of Motivational Interviewing (Miller & Rollnick, 2012),[22,44] to identify associations between their thoughts, emotions, behaviours and bodily sensations. Subsequently, as part of the CBT intervention, patients are guided to carry out behavioural experiments (e.g. exposure to fear-related situations) for testing their thoughts and beliefs related to dysfunctional behaviours, and to develop more functional behaviours. In complex CLBP, traditional CBT approaches have the potential to target the whole psychological symptomology of patients, and not solely the fear-avoidance cycle. However, such interventions may require patient's ability to make sense about the use of psychological approaches, and may only be indicated when they show some interest in psychological issues.

Interventions based on the Psychology Flexibility Model with its therapies known such as Acceptance and Commitment Therapy (ACT) represent the latest wave within CBT.[39] Describing these complex new methods and discussing it is applicability in physiotherapy is beyond the scope of this chapter.

Traditionally, clinical psychologists and psychiatrist apply CBT-based interventions. Since the importance of associated psychological factors in CLBP, it was recommended that other health care practitioners should also be trained to deliver CBT-based treatments for pain patients.[45] In

summary, trained physiotherapists should be able to integrate CBT-based principles and strategies into their clinical practice for CLBP, particularly the approaches based on the operant behavioural model.[46] To apply these psychology-based strategies, it is essential that physiotherapists have the knowledge about basic principles of the cognitive model, as well as effective skills in therapeutic communication and behaviour change techniques. This might require specific extra training.[47]

Posture and Movement Exercises, Relaxation Techniques and Physical Exercises

Specific posture and movement exercises designed to normalize maladaptive posture and movement behaviours are indicated if this domain is a dominant factor maintaining chronic pain and disability. A promising intervention approach combining specific exercises with cognitive components has been developed by O'Sullivan[48] and is named Cognitive Functional Therapy (CFT). This approach demonstrated positive long-term effects in CLBP patients with mechanical behaviour to the pain (provoked and relieved with postures, movements and activities), as well as promising long-term results in patients with disabling CLBP.[48,49] Combining this more functional oriented CFT approach with specific CBT-based strategies seems highly promising in CLBP with co-morbid mental illnesses but needs further investigation.

Relaxation techniques might be indicated in patients with high levels of psychological distress and dominant anxiety disorders. Because of frequently reported difficulties to concentrate during more cognitive-oriented approaches (e.g. visualization, autogenic training), bodily-orientated techniques (breathing exercises and Progressive Muscle Relaxation) tend to be most appropriate in these patients, for reducing stress levels. Patients should also be instructed to perform these exercises independently at home.

Physical activity counselling aiming to facilitate behaviour changes should always be integrated in physiotherapy interventions for patients with complex CLBP. Establishing adequate physical activity levels is highly relevant because of the aforementioned bi-directional association between physical activity and depression. Furthermore, recent meta-analyses on the effect of physical exercise for patients with anxiety, post-traumatic stress and depression disorders disclosed positive effects of aerobic exercises on depressive symptoms.[50-52] In patients with major depressive disorders, largest effects sizes were found for supervised aerobic exercises on moderate intensity.[51] Therefore, physiotherapists should support patients to reach adequate level of physical activity and to exercise regularly, at least with moderate intensity. Delivering physical exercises for patients with CLBP and co-morbid mental illnesses might be challenging. Firstly, those patients with central sensitisation are likely to react with an exacerbation of pain related symptoms during physical exercises.[53] In this situations, it is important to prevent muscular ischemia and to plan sufficient

recovery breaks between exercises sessions. Secondly, patients with co-morbid mental illness are likely to experience psychological barriers for being physically active. People with mental illnesses report high levels of social anxiety during physical activity situations.[54] Social anxiety should be considered as important barrier for physical activity participation in complex CLBP. Principles and techniques of Motivational Interviewing[22] might be useful to help patients to overcome resistances for becoming physically active by enhancing patient's intrinsic motivation to change.

Measurement of Treatment Outcomes

Treatment effects should preferably be measured in the following five domains; back specific function, generic health status, pain, work disability, and satisfaction with care and treatment outcome.[55] In day-to-day clinical practice, pain and back specific function might be the most relevant outcome domains for patients in complex CLBP. Additionally, psychological screening tools should be used to detect alterations in cognitions and symptoms of mental illnesses over time.

Conclusions

Psychosocial factors play a significant role in patients with CLBP, and the prevalence of co-morbid mental illness is high. Generally, the clinical picture of these complex patients is multidimensional. Specific interventions are required and need to be targeted at those factors driving the on-going pain and disability disorder. Therefore, the choice of intervention strategy depends of patients' individual needs.

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Appendix II - Appositions

For the promotion of Evidence-Based Practice among physiotherapists therapists' own clinical experience and expertise should be given more weight.

Discussions and opinions on complex problems should not become a privilege of experts.

Scientific publications, others than Randomized Controlled Trials, should receive more attention from clinical physiotherapists.

Appendix III - Curriculum Vitae

General Information

Name: Emanuel Brunner

Birth date: 10 August 1984

Place of birth: Uzwil SG, in Switzerland

Education

2010 – 2012 Master of Sciences in Rehabilitation Sciences and Physiotherapy (magna cum laude), Faculty of Kinesiology and Rehabilitation Sciences, University of Leuven (KU Leuven), in Leuven, Belgium.

2006 – 2010 Bachelor of Sciences in Physiotherapy, School of Health Professions, Zurich University of Applied Sciences (ZHAW), in Winterthur, Switzerland.

Employment

2013 – today Physiotherapist at the Institute for Physiotherapy, Kantonsspital Winterthur (KSW), in Winterthur, Switzerland.

2012 – today Research Volunteer at the Research Group for Adapted Physical Activity and Psychomotor Rehabilitation, Faculty of Kinesiology and Rehabilitation Sciences, University of Leuven (KU Leuven), in Leuven, Belgium.

2012 – 2015 Research Assistant at the Institute of Physiotherapy, Zurich University of Applied Sciences (ZHAW), in Winterthur, Switzerland.

Memberships

- Swiss Organisation of Physiotherapy in Psychosomatics and Psychiatry (SAG PPP)
- Swiss Physiotherapy Association (physioswiss)

Appendix IV - List of Publications

Publications in Peer Reviewed Journals

Brunner E, Dankaerts W, Meichtry A, O'Sullivan K, Baldew SS, Probst M. Factor structure of the German version of the Pain Attitudes and Beliefs Scale for Physiotherapists. *Physiotherapy Theory and Practice* (accepted for publication).

Brunner E, Dankaerts W, Meichtry A, O'Sullivan K, Probst M. Physical Therapists' Ability to Identify Psychological Factors and Their Self-Reported Competence to Manage Chronic Low Back Pain. *Physical Therapy.* 2018: pzy012, https://doi.org/10.1093/ptj/pzy012.

Brunner E, Probst M, Meichtry A, Luomajoki H, Dankaerts W. Comparison of clinical vignettes and standardized patients as measures of physiotherapists' activity and work recommendations in patients with non-specific low back pain. *Clinical Rehabilitation.* 2016 Jan;30(1):85-94.

De Herdt A, Wampers M, Vancampfort D, De Hert M, Vanhees L, Demunter H, Van Bouwel L, Brunner E, Probst M. Neurocognition in clinical high risk young adults who did or did not convert to a first schizophrenic psychosis: a meta-analysis. *Schizophrenia Research.* 2013 Sep;149(1-3):48-55.

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Brunner E, De Herdt A, Minguet P, Baldew SS, Probst M. Can cognitive behavioural therapy based strategies be integrated into physiotherapy for the prevention of chronic low back pain? A systematic review. *Disability and Rehabilitation.* 2013 Jan;35(1):1-10.

Publication in an Academic Book

Brunner E, Dankaerts W. Physiotherapy for Patients with nonspecific chronic low back pain and comorbid mental illnesses. In: Probst M, Skjaerven LH, eds. Physiotherapy in Mental Health and Psychiatry, a scientific and clinical based approach. 1 ed.: Elsevier; 2017, 160-167.

Conference Presentations

Brunner E, Dankaerts W, O'Sullivan K, Meichtry A, Probst M. Common factors perspective in physiotherapy for chronic low back pain. International Conference of Physiotherapy in Psychiatry and Mental Health (IC-PPMH). Reykjavik, Iceland, 10-12 April, 2018.

Brunner E. Common factor model in non-specific chronic low back pain. 4th European Congress of ER-WCPT, the European Region of the World Confederation of Physical Therapy. Liverpool, England, UK, 11-12 November 2017.

Brunner E, Meichtry A, Dankaerts W, Probst M. Validity of the Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT): Results from Exploratory Factor Analysis. 6th International Conference on Physiotherapy in Psychiatry and Mental Health (IC-PPMH). Madrid, Spain, 09-11 March 2016.

Brunner E, Probst M. Cognitive behavioural therapy informed physiotherapy in chronic pain: applicability and challenges in clinical practice. 5th international conference of physiotherapy in psychiatry and mental health (IC-PPMH). Utrecht, the Netherlands, 5-7 February 2014.

Brunner E, De Herdt A, Minguet P, Baldew S, Probst M. Can cognitive behavioral therapy based strategies be integrated into physiotherapy for the prevention of chronic low back pain? A systematic review. in: 8th Interdisciplinary World Congress on Low Back & Pelvic Pain. Dubai, UAE, 27-31 October 2013.

Brunner E, Minguet P, De Herdt A, Probst M. - Cognitive behavioural therapy based interventions in physiotherapy for prevention of chronic disability in low back pain: a systematic review. 4th international conference of physiotherapy in psychiatry and mental health (IC-PPMH). Edinburgh, Scotland, UK, 9-10 February 2012.

Appendix V - List of Abbreviations

CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CLBP	Chronic Low Back Pain
CV	Clinical Vignettes
EFA	Exploratory Factor Analysis
FABQ	Fear Avoidance Beliefs Questionnaire
ICC	Intra-Class Correlation Coefficient
IPQ-R	Revised Illness Perception Questionnaire
IPQ-R HR	Revised Illness Perception Questionnaire for Healthcare Professionals
KMO	Kaiser-Meyer Olkin
KSW	Kantonsspital Winterthur
Kw	Weighted Kappa
LBP	Low Back Pain
N	Number of Participants
N/A	Not Applicable
NRS	Numeric Rating Scale
RMDQ	Rolland Morris Disability Questionnaire
SD	Standard Deviation
SP	Standardized Patients
TSK	Tampa Scale of Kinesiophobia
PABS-PT	Pain Attitudes and Beliefs Scale
VR-CoDES	Verona Coding Definitions of Emotional Sequences
WAI	Working Alliance Inventory
WAI-SR	Short Form of the Working Alliance Inventory
ZHAW	Zurich University of Applied Sciences
4DSQ	Four-Dimensional Symptoms Questionnaire

„Wege entstehen dadurch, dass man sie geht."

Franz Kafka